THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVI. No. 2146.] LONDON, JUNE 28, 1904. [56TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS, **ORMSIDE STREET, LONDON, S.E.**

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

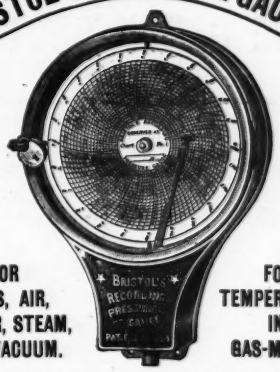
SAFETY GAS-MAIN STOPPER.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

BRISTOL'S RECORDING GAUGES

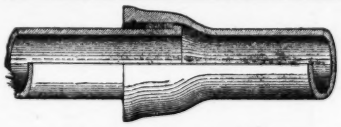


FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.



VERTICALLY CAST IRON PIPES.

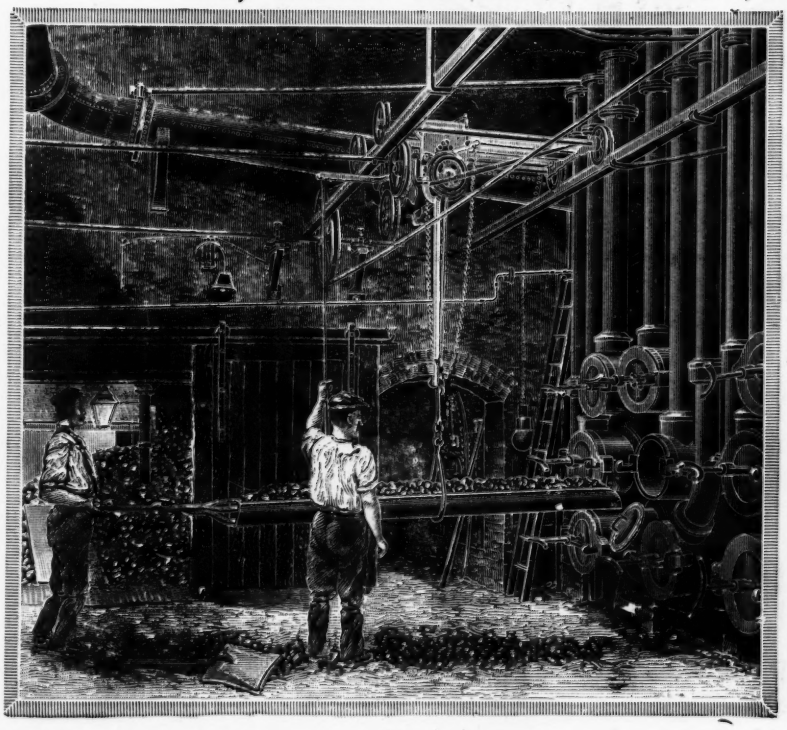
The only Foundry in Europe casting Pipes under Clarifying Process.

Telegrams: "AMOUR, LONDON."
Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

A. G. CLOAKE,
54, HOLBORN VIADUCT, LONDON, E.C.

BIGGS, WALL, & CO.,

13, CROSS STREET, FINSBURY, LONDON, E.C.



Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.

"RAPID"
MANUAL & POWER
CHARGING APPARATUS,
FOR GAS-WORKS OF ALL SIZES.

Repeat Orders
YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
OTLEY	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.

GANDY'S BELTING

Holds the World's Record! 41 Prize Awards!

IN A WATER-GAS PLANT, an important item is the Belt for driving the Blower. Ours are specially constructed **Endless Belts,** and have acquired a reputation for this special Work.

CONVEYOR BELTING—A SPECIALITY.

THE GANDY BELT MANUFACTURING COMPANY, LTD.,

HEAD OFFICES AND WORKS—**SEACOMBE, LIVERPOOL.**

This Trade Mark may be seen stencilled on every genuine "Gandy" Belt.

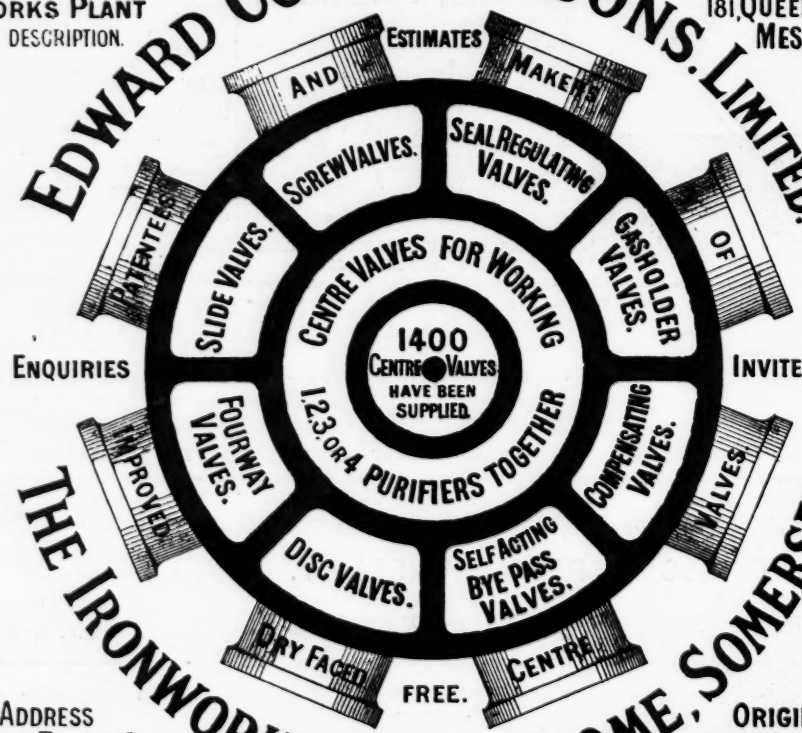
PATENT ADJUSTABLE OVERFLOWS.

ENGINEERS & CONTRACTORS FOR GAS WORKS PLANT OF EVERY DESCRIPTION.

LONDON OFFICE: BRIDGE HOUSE 181, QUEEN VICTORIA ST. E.C. MESSRS. BALE & HARDY, AGENTS.

PATENT WASHERS

PATENT COMBINED BYE-PASS & COMPENSATOR FOR EXHAUSTERS.



TELEGRAPHIC ADDRESS "COCKEYS FROME" "DAMPER LONDON"

ORIGINAL MAKERS OF DRY-FACED CENTRE VALVES. ESTABLISHED OVER HALF A CENTURY.

PATENT FIRE DOORS & FRAMES.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

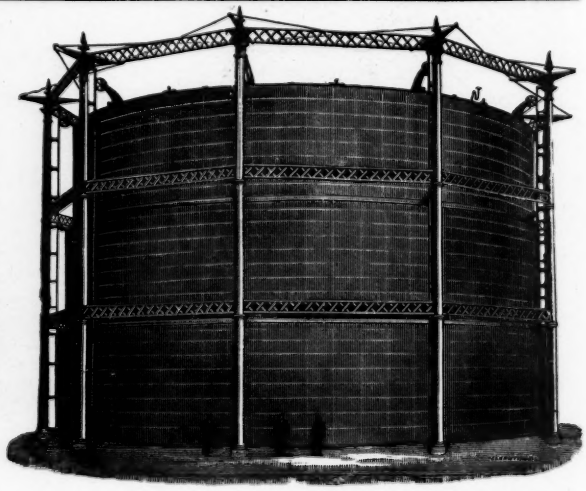
ABERCORN FOUNDRY AND ABBEY WORKS,

PAISLEY, N.B.,

MAKERS OF

Gasholders & Gas Plant

OF EVERY DESCRIPTION.



Telegraphic Address: "Donald, Paisley."

THE BARROWFIELD IRON-WORKS, LTD.,

GAS ENGINEERS AND CONTRACTORS,

GLASGOW.

Telegrams:
"GASOMETER, GLASGOW."

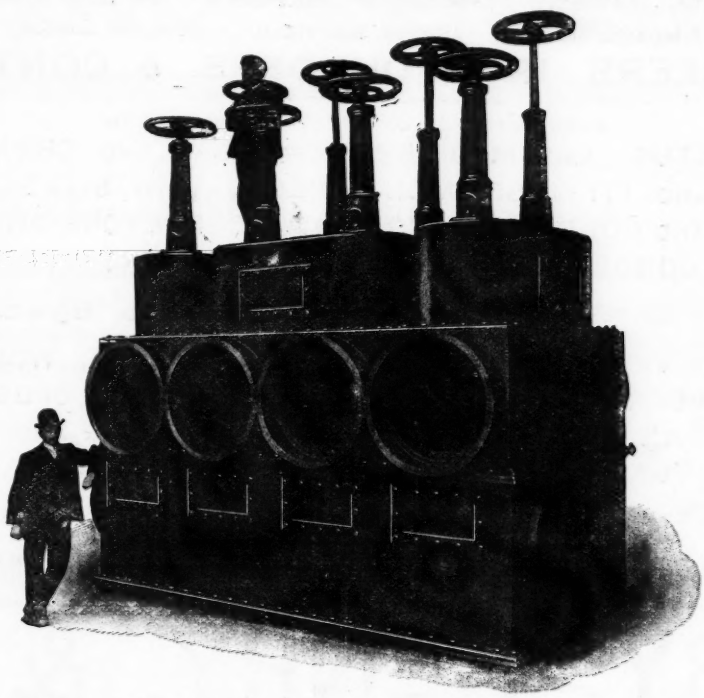
OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office:
6, LITTLE BUSH LANE, CANNON STREET, E.C.



Weck's Centre-Valve for 30-inch Connections for GRANTON GAS-WORKS of the EDINBURGH and LEITH CORPORATIONS GAS COMMISSIONERS.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM-BOILERS, AND FITTINGS.

GEORGE ORME & CO. (Branch of Meters Ltd.)

ATLAS METER WORKS,

PARK STREET, OLDHAM.

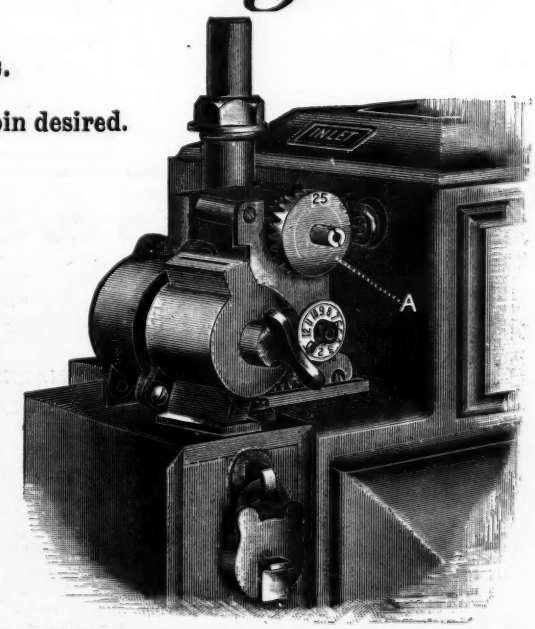
Tel. Address: "ORME OLDHAM."
Telephone No. 93 Oldham.

"NEW CENTURY" PATTERN

Patent Coin *Prepayment Gas-Meters*

Fitted with Detachable Attachments.

Arranged for 1d., 1s., or any other Coin desired.



Change of Price effected by simply removing Crown Wheel "A" and replacing same with another Wheel.

ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS IRONFOUNDERS, & CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT CONVEYORS AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS, CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

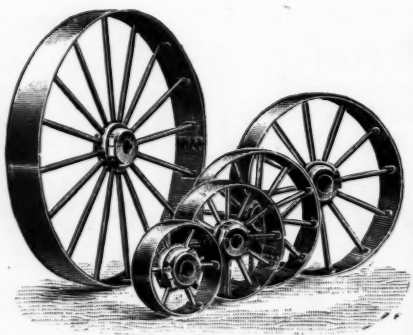
PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its unrivalled excellence.

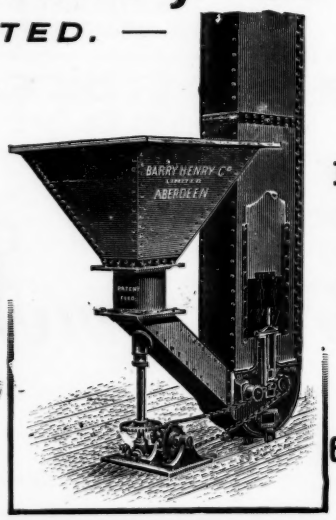
BARRY, HENRY, & CO.,

— *LIMITED.* —

Specialities:
TRANSMISSION OF POWER.
Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals, & Fixings.

WORKS:
ABERDEEN,
SCOTLAND.





Specialities:
TRANSMISSION OF MATERIALS.
Conveyors
Elevators,
Grinding Machinery,
Motors.

AND
64, MARK LANE,
LONDON, E.C.

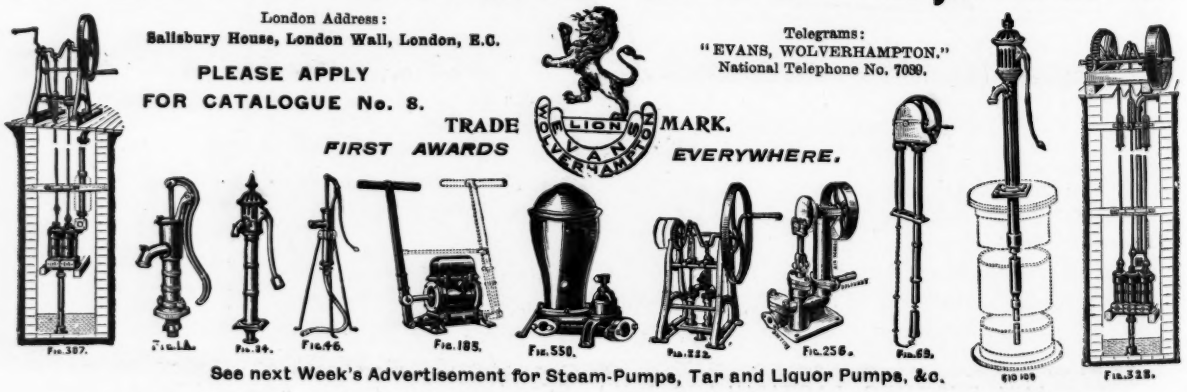
JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

London Address:
Salisbury House, London Wall, London, E.C.

PLEASE APPLY FOR CATALOGUE No. 8.

TRADE MARK.
FIRST AWARDS EVERYWHERE.

Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7089.



See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

THIS TALKS!!!

We have Lighted a Section of Plymouth Docks
for the Great Western Railway Company.

An Extension has been Ordered.

We have completed at Aylesbury an Installation—Town Hall, Market, &c.

The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50 per cent. Cheaper than Incandescent Gas.
70 ,, Electric Arc.
80 ,, ,, Incandescent.
120 ,, Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the **LAST WORD.**

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

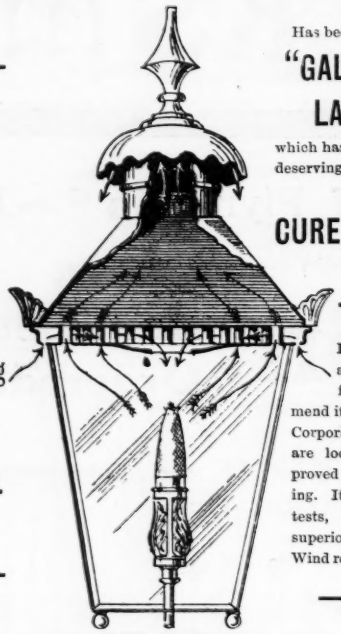
If you want to get MORE LIGHT and CUT THE COST, write—

The British Compressed Gas Co., Ld.,

57, BARBICAN, E.C.

A REVOLUTION IN STREET LIGHTING

Dust, Gale, and Insect Proof. Regenerating and Self-Intensifying.



Square or Cylindrical.

Has been caused by our "GALEPROOF" LANTERN, which has already achieved deserving popularity.

As a CURE FOR "WIND" TROUBLES

It is unrivalled; and we can confidently recommend it to Gas Managers, Corporations, &c., who are looking for an Improved System of Lighting. It has stood severe tests, and proved its superiority in Light and Wind resistance.

PATENTEES AND MANUFACTURERS OF THE

'Wis' High-Power Lamp, 'Pond' Patent Arc Lamp, &c.

62, FARRINGDON STREET, POND & CO., LONDON, E.C.

Gasholders

PURIFIERS

Retort Ironwork

SCRUBBERS

Condensers

WASHERS

Valves

MAINS

Ammonia Recovery Plant

STEEL TANKS

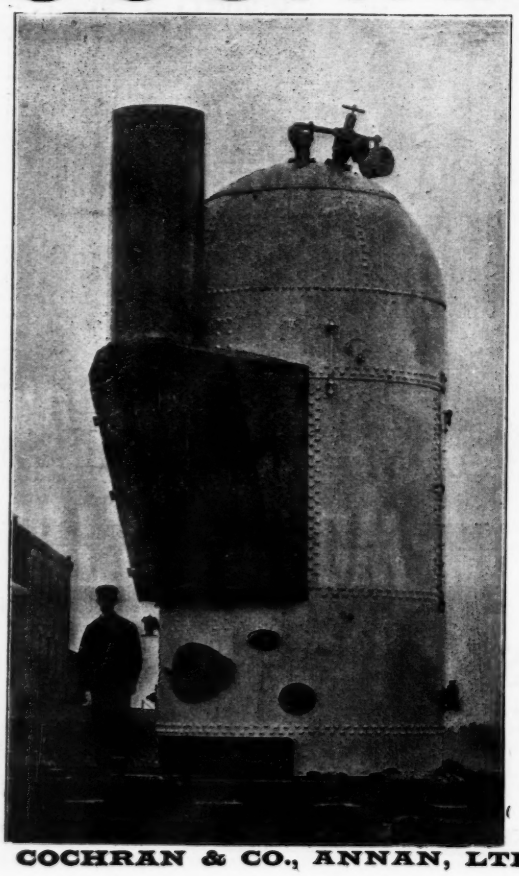
Steel Structures

ASHMORE, BENSON, PEASE, & CO., LTD.,
Stockton-on-Tees.
Telegrams: "GASHOLDER."

COCHRAN

PATENT VERTICAL MULTITUBULAR

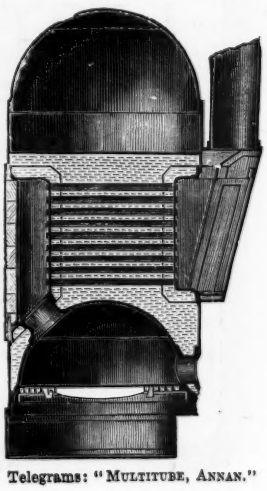
BOILERS.



WRITE FOR LIST A 3

SINGLE BOILERS FROM 10 TO 150 I. H. P.

BATTERIES UP TO ANY POWER.



London Office: SANCTUARY HOUSE, TOTHILL STREET, WESTMINSTER.
Telegrams: "MULTITUBE, LONDON."
Telephone: 650 VICTORIA.

COCHRAN & CO., ANNAN, LTD., ANNAN, SCOTLAND. Telegrams: "MULTITUBE, ANNAN."

WELSBACH KERN

THREE-BURNER HOT-PLATE.

Each Burner of Varying Power.

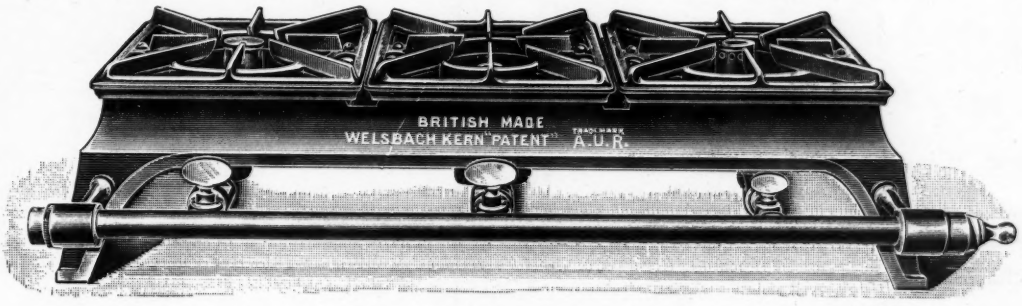
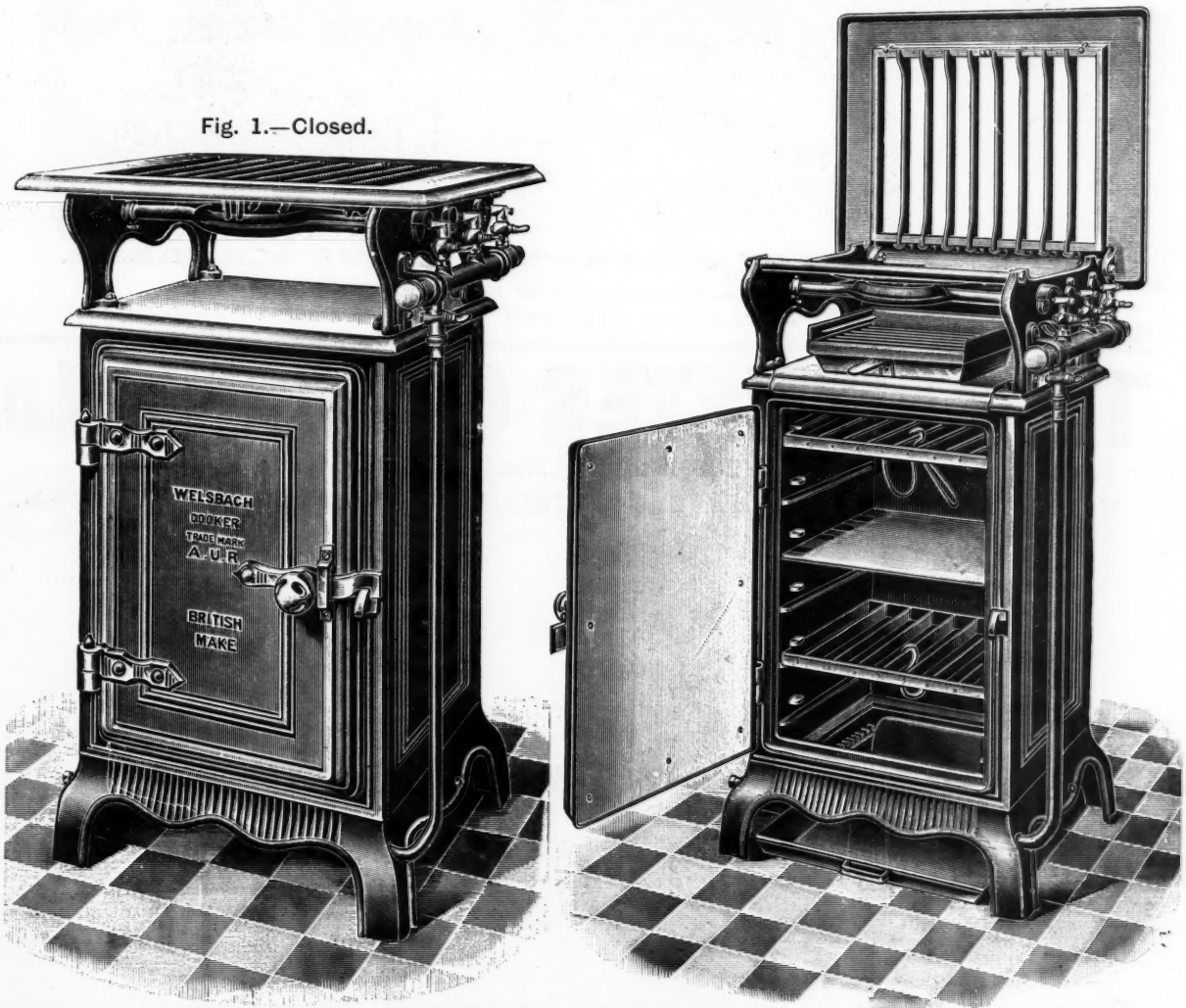


Fig. 2.—Open.

Fig. 1.—Closed.



Write for full Catalogue of WELSBACH and KERN COOKERS, GRILLERS, BOILERS, HOT-PLATES, IRONING-STOVES, &c.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

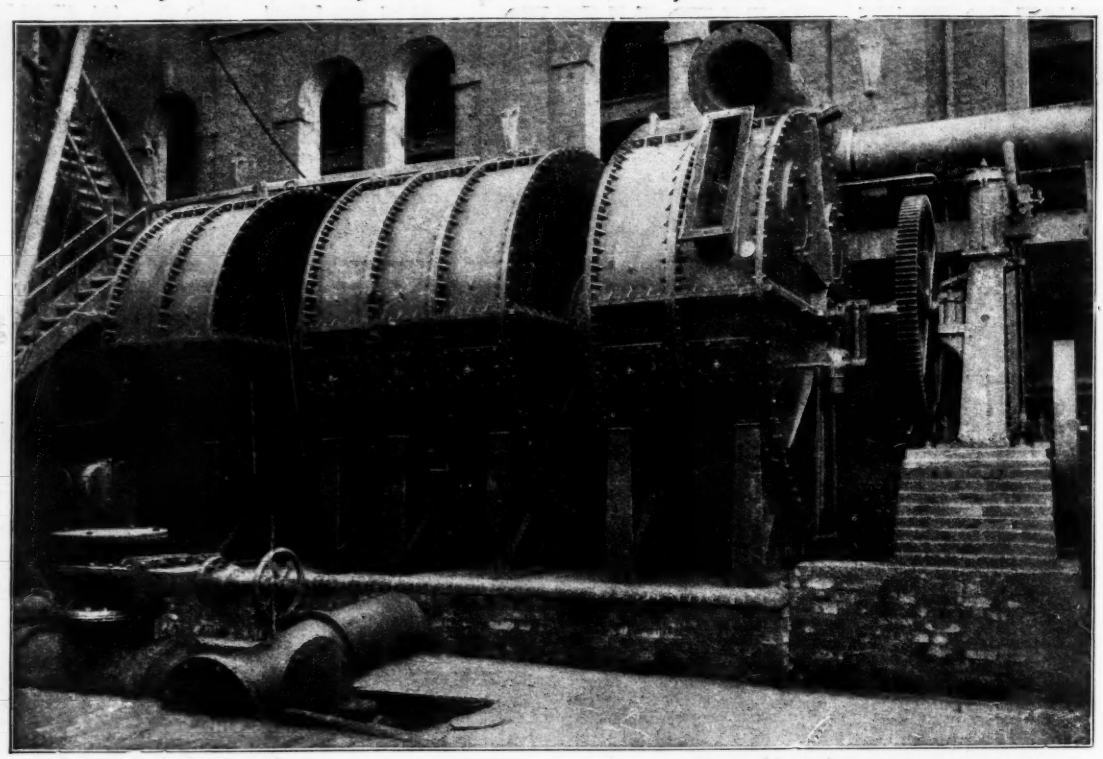
2-14, Palmer Street, Westminster, London, S.W.

Telegrams: "WELSBACH, LONDON." **Telephone: 290 WESTMINSTER.**

KIRKHAM, HULETT, & CHANDLER, LTD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

Extracts ALL the Ammonia and large proportion of CO_2 and H_2S.



Maximum Washing Surface. Easy access to Bearings and Interior.

IMPROVED PATENT "STANDARD" WASHER-SCRUBBER.

Telegraphic Address: "WASHER, LONDON."

Telephone No. 127 VICTORIA.

THE GAS-METER COMPANY, LD.

WORKS: 238, Kingsland Road, LONDON, N.E.;

Union Street, OLDHAM; Hanover Street, DUBLIN; 20, Fennel Street, MANCHESTER.

AUTOMATIC METERS

FOR ANY COIN.

To change Price of Gas, remove Wheels marked T & B (Top & Bottom); replacing them with other Price Wheels sent free on application.

Front View with Index Door Removed

Telegraphic Addresses: "METER LONDON." "METER OLDHAM." "METER DUBLIN." "METER MANCHESTER."

Nat. Telephone Nos.: 142 DALSTON. 340 OLDHAM. 1995 DUBLIN. 2918 MANCHESTER.

GUARANTEED 5 YEARS.

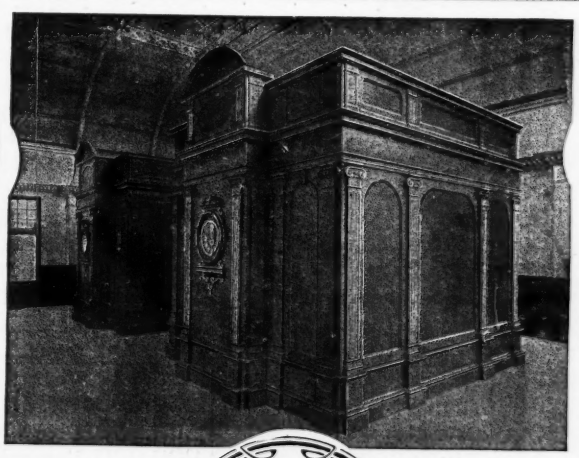
WETS OR DRYS.

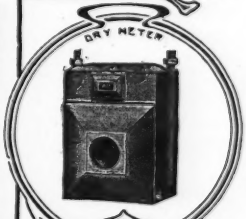
"ACME"
Gas-Cookers

Bring the
BUSINESS.

Arden Hill & Co.,
"Acme" Works,
Birmingham.

R. LAIDLAW & SON,
LIMITED
GAS & WATER ENGINEERS,





SIMON SQUARE
WORKS,
EDINBURGH.

6
LITTLE BUSH
LANE,
LONDON,
E.C.

TWO STATION METERS
EACH TO PASS 200000 CUB. FT.
PER HOUR. ERECTED AT THE

GRANTON GAS WORKS
FOR THE EDINBURGH & LEITH
GAS COMMISSIONERS.

ALLIANCE FOUNDRY &
ENGINEERING WORKS,
GLASGOW.

Messrs. HUMPHREYS & GLASGOW

CARBURETTED-WATER-GAS PLANT

— DOUBLE-SUPERHEATER SYSTEM. —

	Cubic Feet Daily.		Cubic Feet Daily.		Cubic Feet Daily.
Copenhagen	700,000	Holyoke, Mass	600,000	Maidenhead	225,000
Copenhagen (Second)	2,500,000	St. Joseph, Mo.	750,000	Epsom	225,000
Belfast	1,700,000	Lea Bridge	350,000	North Middlesex	150,000
Belfast (Second)	4,500,000	Lea Bridge (Second)	350,000	Wandsworth & Putney	1,800,000
Brussels—Ville	750,000	Stockton-on-Tees	500,000	Aarhus	800,000
Brussels—Ville (Second)	750,000	Edinburgh	2,000,000	Falmouth	150,000
Liverpool	3,500,000	Guildford	350,000	Southampton	800,000
Liverpool (Second)	4,500,000	Brentford	1,200,000	Hartlepool	750,000
Tottenham	750,000	Syracuse, N.Y.	850,000	Utrecht	1,000,000
Tottenham (Second)	750,000	Bridlington	150,000	Deventer	150,000
Santiago de Cuba.	400,000	Middlesbrough	1,250,000	Portsmouth	1,000,000
Swansea	750,000	Croydon.	1,250,000	Bournemouth	1,000,000
Manchester	3,500,000	L. & N.W. Rly., Crewe	700,000	Aylesbury	150,000
Brighton	1,750,000	Taunton.	225,000	Hamburg	1,750,000
Preston	1,400,000	Lawrence, Mass.	400,000	Redhill	275,000
New York	1,200,000	Commercial Gas Co.	850,000	Dublin	2,000,000
Southport	750,000	Commercial (Second)	850,000	Posen	450,000
Bath	1,000,000	Commercial (Third)	1,250,000	Dunedin, N.Z.	150,000
Newburgh, N.Y.	350,000	Rotterdam	850,000	Lincoln	500,000
Newburgh (Second)	250,000	Dorking.	150,000	Brighton (Second)	1,850,000
Hoylake.	125,000	McKeesport, Pa.	500,000	Stockport (Second)	600,000
Coventry	600,000	G. L. & C. Co., Bromley	3,750,000	Croydon (Second).	625,000
Coventry (Second)	600,000	G. L. & C. Co., Nine Elms	2,750,000	Maidenhead (Second)	225,000
Bordentown, N.J.	125,000	Durham.	200,000	G. L. & C. Co., Beckton	2,250,000
Winchester	225,000	New York	4,000,000	G. L. & C. Co., Fulham	1,750,000
Shanghai	225,000	Scarborough.	800,000	Watford.	300,000
Stockport	600,000	Perth, W.A.	125,000	Eastbourne	1,250,000
Norwich	1,000,000	Bremen.	550,000		

Since Jan. 1st 1900.

Antwerp	1,500,000	Waltham	400,000	Sydney—Harbour (Second)	500,000
Brussels—Forest	1,000,000	Geneva	500,000	Sydney—Mortlake (Second)	500,000
Tottenham (Third)	350,000	The Hague	1,000,000	Watford (Second).	350,000
Sydney (Harbour)	500,000	Romford.	300,000	Southport (Second)	900,000
Sydney (Mortlake)	500,000	Göteborg	300,000	**FOR THIS YEAR'S CONSTRUCTION.**	
Manchester (Second)	3,500,000	Carlisle	600,000	Dunedin (Second).	275,000
Longton	600,000	Redhill (Second)	300,000	Taunton (Second).	350,000
Hull	1,500,000	Heidelberg	200,000	Bognor	100,000
St. Gallen	225,000	Rotterdam (Second)	1,500,000	Bournemouth (Second)	500,000
Colney Hatch	400,000	North Middlesex (Second)	200,000	Vienna	3,500,000
Dublin (Second)	2,000,000	Rotterdam (Third)	750,000	Maastricht	200,000
Birmingham.	1,500,000	Merthyr Tydfil	300,000	Antwerp (Second).	1,000,000
Tunbridge Wells	1,000,000	Shanghai (Second)	225,000	Tottenham (Fifth)	1,000,000
Faversham	200,000	Magdeburg	1,400,000	The Hague (Second)	500,000
Staines	600,000	Posen (Second)	700,000	Hampton Court	500,000
Commercial (Fourth)	2,000,000	Barrow	300,000	Lea Bridge (Third)	400,000
Southampton (Second)	500,000	Reichenberg	200,000	Dublin (Third)	650,000
Liége	1,000,000	West Ham	1,500,000	North Middlesex (Third)	75,000
Hebden Bridge	200,000	Deventer (Second)	200,000	St. Gallen (Second)	225,000
Chorley	300,000	Bremen (Second)	950,000	St. Josse, Brussels	1,000,000
Stafford	500,000	Malta	400,000	Dundee	1,500,000
Bridlington (Second)	200,000	Croydon (Third)	625,000	Bridgwater	200,000
Beckton (Second).	10,750,000	Tilburg	400,000	West Ham (Second)	800,000
Tottenham (Fourth)	1,000,000	Ostend	100,000	Brieg, Silesia.	100,000
Gosport.	200,000	Zwolle	200,000	Brussels—Ville (Fourth)	350,000
Brussels—Ville (Third)	1,500,000	Utrecht (Second)	1,000,000	Innsbruck, Austria	200,000
Swansea (Second)	1,000,000	Port Elizabeth	400,000	Marlborough	100,000

H. & G. TOTAL OF ABOVE CAPACITIES **150,200,000** CUBIC FEET DAILY.
UNITED GAS IMPROVEMENT CO., U.S.A. **423,600,000** CUBIC FEET DAILY.

TOTAL 573,800,000 CUBIC FEET DAILY.

38, VICTORIA STREET, LONDON, S.W.
Telegrams "EPISTOLARY LONDON.

UNITED STATES OFFICE:
31, NASSAU STREET, NEW YORK.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—

Professor Unwin and the Transmission of Gas at High Pressure 929
The German Association Meeting at Hanover 929
Corrections of the Recommendations of the Board of Trade Committee. 930
The Law of Income-Tax Payments out of Maximum Gas Dividends 931
Further Evidence for the Royal Commission on Trade Disputes 931
The Protection of Gas-Mains—Progress at Plymouth — And Free Maintenance — Further Comments on the Testing Committee's Report 931

WATER AFFAIRS—

London Water under New Management . 932

ESSAYS AND REVIEWS.

Gas and Water Stock Market 933
A Suggested Schedule for Gas Testing . . 933
Electric Lighting Memoranda 934
The Growth of a Continental Gas-Works . . 936
Passing of the London Water Companies . 939
Gas *v.* Electricity and Steam for Pumping . 940

COMMUNICATED ARTICLE.

The Report of the Board of Trade Testing Committee. By Jacques Abady. . . . 935

TECHNICAL RECORD.

German Association of Gas and Water Engineers—Meeting at Hanover 941
Manchester and District Junior Gas Association—Visit to Stalybridge 950
Société Technique du Gaz en France—Annual Congress in Paris—
An Elevating-Charging Machine. . . . 951
Charging Machines at Villeurbanne (Lyons) Gas-Works. 952
Recent Progress in Incandescent Gas Lighting 954
Automatic Lighting and Extinction of Burners 955
Introduction of Water-Gas into Retorts in which Coal is Undergoing Carbonization . 956

TECHNICAL RECORD (*continued*)—

British Association of Water-Works Engineers—Annual Meeting in Hull—
Mr. W. Watts on Concrete and Puddle for Reservoir Embankments 957

REGISTER OF PATENTS.

Burner for Gas-Stoves—Clarke, E. F.. . . 959
Incandescent Burners and Mantles—Anderson, D. 959
Producing Mixtures of Gas and Air—Lake, H. H. (Selas Gesellschaft m.b.H.) . . . 959
Gas-Washers—Imray, O. (Burgemeister, F.). 959
Process for Making Gas—Kent, W. . . . 959
Manufacture of Metallic Alloys having Pyrophoric Action and their Application to the Purposes of Ignition and Illumination—Auer von Welsbach, C. F.. 960
Incandescent Gas-Burners—Stickdorn, R. . 960
Producing Poor Gas Free from Tarry Matters—Boutillier, L. 961
Patent Notices 961

CORRESPONDENCE.

The Working of the De Brouwer Projector . 961
Mr. Cranfield's Presidential Address . . . 961
Flow of Gas in Mains and Distribution at High Pressure 962
Mr. H. E. Jones and the Nanterre Gas-Works Installation 962

LEGAL INTELLIGENCE.

The Water Companies' Appeals to the House of Lords 970
Supreme Court of Judicature—Court of Appeal—Attorney-General *v.* Ashton Gas Company; Payment of Dividends Free of Income-Tax 970
High Court of Justice, Ireland—Chancery Division—Thompson and Son *v.* Belfast Corporation 970
Dublin Police Court—Question as to the Depth of Laying Gas-Mains 971
Gas-Mains and the Laying of Electric Cables 972
Charge of Embezzlement against a Secretary 972
Conviction for Selling Spurious Welsbach Mantles 973
Compensation for Poisoning by Coal Gas. . 973
Disputed Liability for a Gas Account . . . 973

PARLIAMENTARY INTELLIGENCE.

Progress of Bills 962
House of Lords Committees—
The "Bermondsey Clause" in Electric Lighting Provisional Orders 963
Gas Orders Confirmation No. 1 (Bognor Gas Order) Bill. 968

MISCELLANEOUS NEWS.

Committee on Metropolitan Gas Testing . . 973
Next Year's Examinations in Gas Manufacture—The Question Papers 978
Plymouth and Stonehouse Gas Company. . 978
Swadlincote Gas Supply—A Successful Year 979
Oldbury Gas Department 980
Public Lighting of Norwich—Gas Preferred to Electricity 980
Ossett Corporation Gas Supply—Progress of the Undertaking 981
Edinburgh and Leith Gas Commissioners—The Annual Accounts 982
Metropolitan Water Board 982
Notes from Scotland 983
Current Sales of Gas Products 984
Coal Trade Reports 985

PARAGRAPHS.

Gas *versus* Electricity for Public Lighting at Canterbury 935
Transactions of the Society of Engineers. . 939
The Southern Association Meeting at Reading—International Acetylene Association—Incandescent Gas Lighting for Schools . . 953
Smethwick Gas Supply—Coventry Water Supply 962
Suicide by Gas—New Water-Works at Street 969
International Gas Exhibition, Earl's Court—Torquay Corporation Water-Works. . . 973
Reduction in Price 980
Mansfield Corporation Gas and Water Supply 981
Incandescent Gas Lighting in New York—Incandescent Gas Lighting for Kingsteignton—Sale of Stocks and Shares—Birkdale Gas Supply—Devonport Water-Works Arbitration—Incandescent Gas Lighting in Stepney—The Marylebone Electric Lighting Scheme 986
Winchcombe Gas Company, Limited—The Richmond Gas-Stove Competition—Barnoldswick Gas Supply 987

HENRY BALFOUR & CO.

LIMITED,

LEVEN, FIFESHIRE.

Contractors for the Supply and Erection of all Classes of

Gas-Works Plant.

THE "ANNULAR" BRUSH WASHER-SCRUBBER

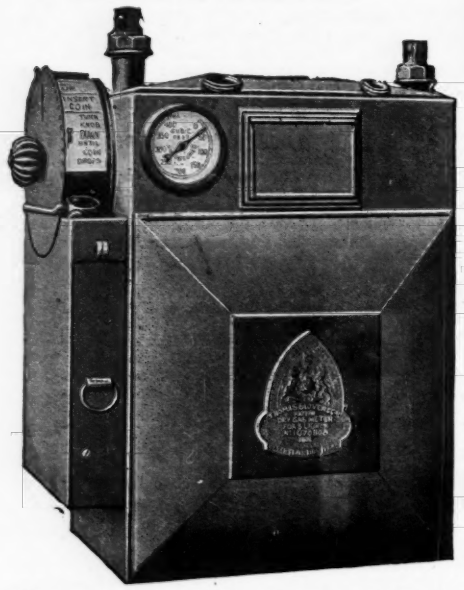
(CREEKE'S PATENT).

Made with Cast-Iron or Mild Steel Cylinders.

PRICES AND PARTICULARS ON APPLICATION.

London Representative: MR. HENRY PUPLETT, 47, VICTORIA STREET, S.W.

THOMAS GLOVER & CO.'S



PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.	57 & 58, BROAD STREET. *Telegraphic Address:* "GOTHIC"	132 & 134, CORN EXCHANGE BUILDINGS. *Telegraphic Address:* "GOTHIC." Telephone No. 3898.	26, WEST NILE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107 Royal.	8, EXCHANGE PLACE, DONEGALL STREET. *Telegraphic Address:* "GOTHIC."	23, WRIGHT'S LANE, LONSDALE STREET. Telephone No. 3716.

PARKINSON'S

DRY METERS

ALL SIZES KEPT IN STOCK.

PARKINSON AND W. & B. COWAN, LTD.
(Parkinson Branch)

COTTAGE LANE, CITY ROAD, LONDON.

BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXVI., No. 2146.—TUESDAY, JUNE 28, 1904.

EDITORIAL NOTES—GAS, &c.

Professor Unwin and the Transmission of Gas at High Pressures.

THE paper by Professor W. C. Unwin, on "The Flow of Gas "in Mains, and Distribution at High Pressure," published in last week's "JOURNAL," must be esteemed the final word of physical science on the subject-matter. We particularly desire to endorse all that was said at the Institution meeting as to the indebtedness of gas engineers to Professor Unwin for his work, which is far above criticism. It will be universally conceded that the new formula for the discharge of gas-mains due to this author, and amply explained in his paper, is, as he calls it, exact. It will always constitute one of the riches of the Transactions of the Institution of Gas Engineers; and any future treatise on the transmission of gas through pipes which does not give it its proper place after Dr. Pole's formula will be imperfect. We are quite free to say all this of Professor Unwin's work, which we indeed hold in great admiration, and, having done so, must take the liberty of entering into a brief public statement as to how this splendid paper affects the views of the merit of high-pressure gas transmission which have been expounded from time to time in the "JOURNAL" editorials. In a word, it does not affect them at all. The physics of this proceeding are as Professor Unwin states them; the economics are less clear. We have never accepted as proved the case for extremely high-pressure gas transmission with which the name of Mr. F. H. Shelton, of Philadelphia, is identified. But this reserve had no particular technical basis, and it expressly left open the case of very exceptional examples. Nobody at the present day doubts the possibility of making and keeping gas-mains tight under any imaginable pressure, nor even of obtaining as high a main pressure as the most exuberant fancy desires, at a cost which is not prohibitory. So far, we go willingly enough; but not much farther. For, when asked to what purpose these conditions should be accepted, the implied doubt has always struck us as difficult to dispel, all things being considered.

Let us see what Professor Unwin says about it: "It has "been shown that the discharge of a main depends on the "pressure difference per mile of main, and that with con-"siderable but perfectly manageable pressure differences "much smaller mains could be used than are usually "adopted." Agreed; though we would rather put it the other way, and say that mains such as are commonly employed could be made to convey much more gas than is usual. But how? "All that is necessary is to have com-"pressing machinery at the station, and pressure-regulating "apparatus at the points of delivery." Yes, and keep them always going—there's the rub! "It is clear that in this "way the economy of cost of mains would be very great." It would at least be an element worth a thought; especially as it is the one solitary advantage to be set against a host of extra-special expenses, anxieties, and risks. Professor Unwin makes no attempt whatever to answer the question of the desirability of the proceeding to which he has applied a rule of quantitative determination, and believes with good reason to be quite feasible. This being the truth, we are bound to observe that the paper leaves the essence of the matter exactly where it was when, in the "JOURNAL" for the 27th of October last, we discussed the subject on data supplied from America. That is to say, it can be done anywhere; but whether it is worth doing, is a question of expediency to be answered with regard to the conditions of every individual proposal of the kind. The responsible gas manager who desires to sleep at night will be cautious how he favours pressure-machines instead of gravity plant.

The title of Professor Unwin's paper is a double-barrelled one; and the second part is a misnomer. There is no such thing as gas "distribution" at high pressure; nor can there be without altering all the consumers' meters, governors, and so forth. What he has called "distribution" is merely "transmission"—a totally different thing. The pressure at which gas has to be distributed is strictly limited, and in the case of the supply of ordinary gas the business of distribution is very much mixed up with that of transmission. Whatever fancies may occupy the brain of the unattached mechanical engineer, or the professor of mechanical engineering, and attract him in the direction of high-pressure gas transmission, it is really the bottom fact with which the gas manager has to reckon, that no pressure above that required to satisfy the consumer is of any intrinsic value to him. The consumer has no use at all for a pressure greater than 2 inches of water; and therefore to this standard all distribution must conform, though the mechanical engineer laugh never so loudly. The gas manager need not stop his ears to this sound of merriment. On the contrary, he should keep both them and his eyes very wide open so as to learn what outsiders, who proverbially have a far outlook over the game, have to teach him. But the game, after all, must be played according to the rules. Transmission of gas, water, or electricity to a distance, as distinct from distribution, is a necessary evil in most instances. A trunk main, with no services on it, is not a source of profit. Many things have to be reckoned in before the prudent gas manager can decide incontestably that it is expedient to save on the capacity of the trunk main, and dispense with a district holder, and work everything, for every hour of the twenty-four, by pumping from one end. The cases for any other solution than by means of substantial, durable, cast-iron mains, with a relief holder to help during the brief times of maximum consumption, will be rare exceptions in most settled countries.

The German Association Meeting at Hanover.

BY a combination of happy circumstances, this year will be marked as a red-letter one in the annals of the Hanover Gas-Works of the Imperial Continental Gas Association. On the 13th of this month, the veteran Engineer of those works (Herr L. Körting), celebrated his seventieth birthday; and the occasion was made one of great congratulation on the part of first the works staff and men, and secondly by the representatives of the city authorities and various institutions. On the last day of this year, too, Herr Körting will also celebrate his official jubilee; for it will then be fifty years since he took charge, at the request of the then Board of Directors, of the management of the Hanover works in succession to his father. This is the second official jubilee that the Imperial Continental Gas Association will have witnessed in recent years; for it will be remembered that not long since we had the pleasure of chronicling the jubilee of Mr. William Drory, of Frankfort. Besides, there are other of the chief officers on the Continent who have had considerable stretches of service. This speaks volumes of the sagacity of the Directors long years ago in the choice of their officers, and also of the harmonious character of the relations between Board and officers which have, without intermission, coursed through the passing years. We have before observed this from the London side. Last week there was an opportunity of observing it even more intimately at the annual meeting, in the beautiful city of Hanover, of the German Association of Gas and Water Engineers, when one could not fail to note the interest the Board take in the professional connections of their officers, and the care which they exercise in assisting to maintain, through their representatives, the prestige of the Imperial Continental Gas Association among the gas men and undertakings of the Continent. It will have been gathered from this that the year will not only be recorded in the history of the Hanover Gas-Works as the one in which Herr Körting reached his seventieth birthday and jubilee as the Manager of the undertaking, but as the one in which the German Association of Gas and Water Engineers held their annual convention in the city, and moreover with Herr Körting as the President, which circumstance, again, brings into view the high regard of the gas and water engineers of Germany

outside the Imperial Continental pale for the Engineers within it. This is emphasized by the fact that on Friday the former honoured the President by placing him in the chair for a second time. Thus this eventful year stands out in his long professional life as the happiest that Herr Körting has experienced; and on behalf of those of his professional friends for whom we may speak on this side of the North Sea, we most sincerely congratulate him.

We need not dwell at great length here on last week's meeting, and on what was seen and heard at Hanover. It will all be found set forth—true in parts briefly—in other columns; and if the proceedings have not had, as their result, great technical advancement, or brought to light any remarkable achievement, it must be admitted that, between the meetings and the Hanover Gas-Works, there has been a good yield of readable matter. The address of the President was reminiscent, and, perused in conjunction with the historical account which we publish of the undertaking and with the notes on the visit paid by the members to the works on Thursday evening, engineers on this side will learn much about the growth of a gas undertaking in a representative city of Germany, of the tribulations of past years, and of the manufacturing and commercial successes. There is one thing in particular for which the Hanover Gas-Works are famous; and it is that, with simple plant and hand labour alone, Herr Körting has been able to make gas at a cost to which, no matter how strenuous the effort, the other undertakings of the Association have not been able to descend. Of course, there may be favourable circumstances at these works, not found at others, that have contributed to this notable result; but the fact deserves record. Now, after his long success, even Herr Körting, at the behest of labour, has had to appeal to mechanical devices; and, it may be imagined, much to his regret. In the technical gas line, the meeting, as already indicated, did not produce such an abundance as we had looked for. When published in their complete form, the contributions by Professor Drehschmidt on the testing of gas coal, by Dr. Schilling on the lighting of school-rooms by gas and electricity, and by Herr Stack on the use of gas coke, will be found to be of the greatest interest; but beyond them there is not much for the gas technician. In the water line, there were a couple of communications of a high order.

There is, however, great activity in the Association in the realm of inquiry. The report elsewhere will show that they have several Committees now engaged upon researches of various kinds; and the estimates of expenditure for these purposes passed last Friday are an earnest of the wish of the members to push this class of work forward both to the benefit of future meetings and of the gas industry in general. Some of the members have a longing, too, for the establishment of experimental gas-works at Carlsruhe, under the immediate superintendence of Dr. Bunte, whose unavoidable absence from the meeting was greatly deplored. The initial and annual expenses are, however, troubling the minds of many of the members; and a unanimous assent to the scheme has not yet been secured. Further information is desired; and the first step was taken to obtain this by a resolution that, before the next annual meeting, plans and specifications for the works should be prepared, and then the general subject will be further discussed. Work of this kind cannot be carried on without funds; and it is to be hoped that, for the general good, the funds will not be found wanting, and that the gas undertakings of the country will be willing to subscribe what is necessary. Their engineers cannot be expected to do this; but as the greater number of the gas-works in Germany are under municipal control, there may be considerable difficulty in making adequate provision. In addition to this consideration, Professor Drehschmidt's paper was a forcible argument in favour of all gas-works of sufficient size having coal-testing plants of their own; and those directing the large works may not, in the event of their adopting this suggestion (if they have not already done so), see any reason why they should also support research work elsewhere. We can see reasons why they should, and most gas engineers will likewise see them; but the lay mind, where there is not a visible or tangible return for outlay, is difficult of impression and conviction.

However, the meeting last week was of great interest and enjoyment for all who were attracted to Hanover by it—the number, including ladies, being between 800 and 900. For the great success, much credit belongs (through the perfection of the arrangements) to the officers, staff, and workmen of the Imperial Continental Gas Association at Hanover, and to the Board in London. From the President and his Chief Assistant (Mr. W. Anderson) down to the lowliest workmen connected with the station, all who had the opportunity did their part in large or small degree. The results and the recollections of those present are the reward of the workers.

Corrections of the Recommendations of the Board of Trade Committee.

THE communication from Mr. Jacques Abady, on the report of the Board of Trade Committee on the Testing of London Gas, adds yet another stone to the monumental pile under which this deplorable document is being buried. Whether any of the Committee's recommendations are strong enough to rise again from under such a load of obloquy, is a question for well-wishers of the gas industry now to ask themselves. It appears to us that the photometrists have said enough about the unfortunate wrong turning taken by the Committee in search of another name for 14-candle gas. One would have welcomed an argument in defence of their proceeding; and we can merely say that if such a plea should at any time reach us—and the sooner the better—it shall have at least as fair treatment, as to publicity and criticism, as anything that has hitherto appeared on the other side. Meanwhile, the responsible advisers of the Board of Trade, having knowledge of the needs of the gas industry, may well take heed of the remarkable agreement that manifestly exists among those who have expressed their views on this part of the findings of the Committee. Our own observations upon the subject might have been drafted in collaboration with Dr. Colman and Mr. Abady, so similar are the points taken, making allowance for individual forms of statement. As Mr. Abady remarks, if all the developments of the questions arising out of the report were fully gone into, a whole number of the "JOURNAL" would be occupied with only a selection from them. The really weighty consideration is that the latest fruit of the expert criticism of the photometry of the Committee possesses a positive value. It has passed beyond the destructive phase, and, having demolished the baseless and reactionary recommendation of the Committee, sets out plainly the better way which should be substituted for it. Was it this that, in indulging a kind of wisdom of the Machiavellian type, the Committee were fishing for? Did the members—scientific, legal, and technical—tacitly agree upon a piece of counsel which appeared to be the only alternative to a minority report (or two), well knowing that it would forthwith draw the fire of all the critics, and thereby disclose the real strength of the industrial position? It is a reflection that may strike Mr. Gerald Balfour as well founded. At any rate, whether or not he sees the point, the truth is with these critics, both as to destruction and construction.

Both the Board of Trade and the Committee thoroughly deserve the attribute of fairness unhesitatingly awarded to them by Mr. Abady. Again, nobody has denied it. The Committee must be credited with entire absence of bias; and we cannot go so far as Mr. Abady, and accuse them of "an exceedingly unfortunate desire to burke the main "issue." Rather, it appears to us that they allowed their minds to be swayed by the idea that illuminating power is a meaningless term, so that it does not matter how a definition is arrived at, so long as it is arrived at in one particular way. It is the modicum of truth in this view of the subject which renders the illogical deduction of the Committee so dangerous. Let us put it in the form of a syllogism: The illuminating power of gas is only a name, which expresses the product of a number of factors. Any one of these factors may be regarded as of critical value. Therefore, to give it a name, illuminating power is the result of burning gas at the rate of 5 cubic feet per hour, which is one of the factors, "which," say the Committee, "is what was to be "demonstrated." But their critics would alter this, in parliamentary fashion, by leaving out all the words after "which," in order to insert the words "is absurd," by reason of the fallacy lying concealed in the middle term. Here the question stands. Let it not be forgotten, by all concerned, that the result of the inquiry is, after all, only a piece of advice to the President of the Board of Trade, and that there are constitutional means for correcting it, when the time for doing so arrives.

The Law of Income-Tax Payments out of Maximum Gas Dividends.

THE question as to the law of income-tax payments by Gas Companies raised by the case of *The Attorney-General v. The Ashton Gas Company*, as discussed in these columns on the 2nd of February last, was disposed of by the Court of Appeal on Thursday; the Company's appeal against the decision of Mr. Justice Buckley being unanimously dismissed. As was pointed out at the time, the question really was whether the dividends paid by the Company should be less income-tax or free of income-tax. It is provided by the Company's Act of 1877 that the usual standard rates of dividend should be payable to the shareholders; and the Company have been in the habit of interpreting this as a direction to pay the dividends in full. There is not in the Act any direction as to this, in which respect the measure resembles all others of the same class. On the other hand, the income-tax is specified in the Acts relating to it as a charge on profits, not a working expense. Mr. Justice Buckley accordingly found that it was for the Company to pay the tax, and deduct the rateable proportion of it from the dividend payable to every shareholder, as expressly provided by section 54 of the Income-Tax Act, 1842. It was suggested that section 60 of the same Act is entirely inconsistent with the previous section; but the Judge overruled the point. Lord Justice Vaughan Williams holds that the judgment given by Mr. Justice Buckley was quite right. Payment on account of income-tax must therefore be treated as being paid by the Company on behalf of the shareholders. Consequently, if dividends are paid up to the full statutory standard, free of income-tax, the shareholders would be receiving too much. Lord Justice Romer agreed; but his Lordship went a little farther, and gave his views of the incidence of the income-tax on preference dividends, as well as on dividends on ordinary capital. If a company pay income-tax on their profits, the tax is payable out of the profits and as part of them. If the profits, after deducting the income-tax, have to be distributed among the members, they will not have to pay income-tax on their shares again, because the income-tax already paid is taken as having been paid out of their profits and on their behalf. Supposing, for example, a company has preference as well as ordinary shareholders, and the former are only entitled to receive a fixed sum—say, 5 per cent.—then when income-tax is paid out of the total profits, a rateable portion of it must be taken as having been paid in respect of their 5 per cent., from which it has to be deducted. The same principle applies to ordinary shareholders in gas companies, in respect of their dividends, which are also limited. Maximum dividends must therefore be paid less income-tax. Dividends which are not limited in amount may be paid tax free, just as with any other bonus in addition to the declared rate.

Further Evidence for the Royal Commission on Trade Disputes.

IF the Royal Commission on Trade Disputes fail to arrive at a fair view of the office and operation of Trade Unionism in this country, it will not be for want of being told the whole truth—that is so far as Mr. Beasley, of the Taff Vale Railway, knows it. We have already referred incidentally to some of Mr. Beasley's evidence before the Commission; and last week he took a fresh line, in order to demonstrate how the members of Trade Societies which have benefit funds suffer from the statutory protection of the Unions from process on the part of their members. He drew the attention of the Commission to the case of *Mullett v. The United French Polishers' London Society*, in which a member failed to recover from the Society any portion of his contributions to the funds, after he had been expelled for working with a non-society man. The result of this state of the law is that men who may have paid into a society for a lifetime may be deprived of everything, without redress, if they are convicted by the Executive of breaking the rules, sometimes numbered by hundreds. Owing to the non-division of sick and benefit funds from those employed by Society Executives for so-called "trade" purposes, men who have most of their savings in the former are without protection against the consequences of the doings of the firebrands and talkers who so commonly adorn the Union offices. And when it is borne in mind that the ruling propensities of these prominent agitators are always the same—opposition to labour-saving machinery, to the liberty of workers to earn as much money as they can, to the premium or any other system of remunerating labour which is inimical to their influence, and to the employment of non-society men—the proposition that such men can be implicity trusted with the resources of the society becomes very dubious. Mr. Beasley has also criticized the operation of various statutory and other expedients for conciliation and arbitration with respect to labour disputes; showing that the fatal weakness of all arrangements of the kind is lack of power to enforce the decisions. In this connection, it is interesting to note that the existing lull in the industrial politics of the country, already noticed in these columns, has also been recognized by an engineering contemporary, and taken advantage of for the purpose of placing on record the failure of the much-vaunted Labourist legislation of New Zealand. It is truly remarked that a period of agitation may come again, when the question of making fresh laws for the composing of labour disputes will arise once more; so that it is just as well to be prepared for the demand. The experience of New Zealand is that it is impossible to enforce there the awards of Courts of Arbitration in industrial disputes. Rates of wages and conditions of work may be ordered; but it is equally impracticable to get men to work on terms which are displeasing to them, as to oblige employers to give out work under conditions of which they disapprove.

The Protection of Gas-Mains.

There has been some trouble between the Companies who are responsible for the supply of gas and electricity respectively at Chepstow, as a consequence of which the parties a few days ago found themselves before the Magistrates. The facts of the case (which are reported elsewhere to-day) are interesting, and their recital will possibly prove of benefit to those who may be so unfortunate as to meet with difficulty of a similar kind to that which has assailed the Chepstow Gas Company, who have emerged victorious from a fight of considerably more than six months' duration. The dispute began with repeated applications by the Company for the due fulfilment by their rivals of the stipulations contained in section 18 of the Electric Lighting Clauses Act, 1899. These, however, were without effect; and the Company, feeling convinced that damage was being caused to their property by the way in which the electric light people were carrying out the work of laying their cables, were compelled to ask the Board of Trade to appoint an Arbitrator, as specified by the Act. Major Cardew was chosen to hear the case; and he found in favour of the Gas Company—awarding them a sum as damages, and also mulcting the Electric Supply Company in costs. Now the Gas Company have proceeded to recover penalties on two summonses dealing with the same points that the Arbitrator was called upon to decide; and though one of these was dismissed on a technical objection, the Gas Company were successful on the other, with the result of a further financial loss to the Electric Light Company. The matter is not, however, to be allowed to rest here, for the Magistrates have been requested to state a case for the High Court; the Electric Light Company entering into a bond of £150 for expenses. The Company are thus paying pretty dearly for what cannot be anything else than obstinacy on their part, in resisting the legitimate demands of the Gas Company that they should receive the statutory three days' notice before the opening of the roads, and that the cables should not be laid in such a manner as to prejudice the gas-mains.

Progress at Plymouth

It was a very gratifying state of affairs that Mr. J. A. Bellamy, the Chairman of the Plymouth and Stonehouse Gas Company, had to lay before the proprietors at the annual meeting last week. The revenue for the twelve months was higher by some £6000, while there was no corresponding rise in the expenditure. There was an increase of 7 per cent. in the quantity of gas sold, which is particularly satisfactory, in view of the fact, which the Chairman admitted, that the Company have a strong competitor in the electric light undertaking owned by the Corporation. This

result proves that, in Plymouth as elsewhere, there is plenty of room for the two systems, and that the shareholders of the Gas Company can safely rely upon the continued prosperity of the concern. In this connection, however, there is one point with regard to which we do not find ourselves altogether in accord with what Mr. Bellamy said. This is his statement that the increase in consumption would have been enormously greater during the last few years had incandescent gas lighting not been introduced, for the old flat-flame burners would have consumed from one-fourth to one-third more gas than the new ones did. According to this view, the invention of the incandescent mantle has actually proved a misfortune to gas undertakings. It is not generally so regarded; and we do not think that Mr. Bellamy could have intended to use words bearing only this construction. It is true that if every consumer who now uses an incandescent burner would under other circumstances have obtained his light by means of a flat-flame burner, the consumption of gas would have been very much greater; but the question is, Would the Company, under those conditions, have retained so many customers, in face of the competition of electricity? We do not think so; and, if this is the correct view of the case, the argument that the consumption would have been much greater without the introduction of the incandescent system falls to the ground. On the contrary, we should be inclined to say that a very substantial portion, at all events, of the increase of 7 per cent. which did take place in the consumption last year was owing to the fact that, by the aid of a mantle, users of gas are able to obtain a light which is both much better and much cheaper than electricity. It will be seen that Mr. Bellamy himself subsequently admitted that the gas consumption had been augmented through the increasing demand for greater illumination "which modern and more luxurious systems of lighting had fostered." But anyway, the Company's business is increasing, which is the main thing. Among the many other interesting points mentioned by the Chairman, it is to be noted that the fixed charge maintenance system has not been found to work satisfactorily at Plymouth; and now the Company are going to confine their attention to keeping the burners in order, which will be done free.

And Free Maintenance.

The announcement of the Plymouth Gas Company's intention to adopt the system of the free maintenance of consumers' incandescent burners is a confession that the plan of charging a small fixed sum for this service has not proved the success anticipated for it. It has not been entirely a failure. The balance-sheet of the Company for the past year shows that the revenue from this source was £80, as compared with £24 in the previous year. This is a great advance; and if the same rate of progress could be maintained, the system would, in the course of a few years, justify itself in Plymouth, as apparently it has done in other places. After all, however, it is doubtful whether the great majority of the users of incandescent lighting can be brought to adopt and pay for a system of periodical inspection, however small its cost and however great its advantages in the saving of worry to themselves. Mantles do not break down periodically, and the conditions under which the burners are used vary so much in different circumstances that it is doubtful whether periodical cleaning and attention are so advantageous as is sometimes supposed. The objection to "inspection" of any sort which is inherent in the British character, and the feeling that the inspector's visits may occur untimely, are other obstacles in the way of the general application of the scheme to domestic supplies, which constitute the greater part of the business of the Plymouth Gas Company. The new system will be free from some of these objections. Instead of periodical inspection, a man is to be sent to attend to consumers' burners whenever they wish it. This attention is to be given free; but consumers are to provide their own mantles, the time for free mantles not having yet come. The new service ought to be greatly appreciated, and should meet a real need. Many people do not find trouble in the little attention which incandescent burners need; but to others differently constituted it is, no doubt, a cause of vexation. This section of the consumers will appreciate the boon of having at their command the services of an expert whenever they care to summon him.

Further Comments on the Testing Committee's Report.

The latest contributor to the columns of the "JOURNAL" of a criticism of the recently-issued report of the Departmental Committee on the Testing of Gas is Mr. Jacques Abady, whose interesting communication on the subject will be found on another page. Mr. Abady, it will be seen, contends that the policy for gas authorities to adopt is the advocacy of the amendment of the Gas-Works Clauses Act, and every Special Act in which the argand burner is used, and the substitution for the various systems that would then be swept away of a uniform and universal test by the "London" argand burner with a 6 inch by 2 inch chimney with a full flame. In his view, a proper photometrical test has a great measure of utility; but the only test which would be treating all gases with equal fairness is the full-flame test. To secure the amendment of the Gas-Works Clauses Act and Special Acts which he maintains is necessary, Mr. Abady points out that concerted action must be taken; and he is good enough to offer, if desired, to indicate on a future occasion how such action can be put into practical shape. There is no doubt whatever that our readers will welcome as heartily as we ourselves shall this proffered further communication from our esteemed correspondent; and we therefore cordially invite him to send on his "plan of campaign" without delay, in order that it, in its turn, may be subjected to the fiery ordeal of criticism.

WATER AFFAIRS.

London Water under New Management.

ON Friday last, the responsibility for the supply of water to the 6½ millions of human beings comprising the population of London passed out of the hands of the Water Companies, and was assumed by the representative public body specially constituted by the Metropolis Water Act, 1902, to be entrusted with it. The event is the combined result of agitation persistently kept alive over a period of something like fifty years, and of the more general acceptance of the principle that undertakings which are so closely connected with sanitation as water-works should be under the control of municipal authorities, to be managed by them for the benefit, personal and financial, of the community at large—personal in so far as it might bring about improved hygienic conditions, and financial inasmuch as municipal supervision of the business might lead to the production of disposable profits. It was considered the Metropolis was behind the Provinces in this respect. Birmingham, Manchester, and Liverpool, it was said, were owners of their water supplies. Beyond the Tweed, Edinburgh was possessed of magnificent works. Farther west, Glasgow had shown to the world what could be done in providing a thickly-populated city with an abundant supply of pure water. While across the Irish Sea, Dublin and Belfast were supplied by the Corporation and Water Commissioners respectively. Why, then, it was asked, should not London follow these examples?

This question, at first put by a few, came to be so persistently reiterated, that the conclusion was arrived at that "something must be done;" and that the initial step would be to obtain possession of the existing undertakings. It is not necessary to recall here the methods adopted by the advocates of purchase to get the coveted property at the very lowest figure possible. No opportunity was lost to depreciate the value of the works, condemn the quality of the commodity supplied, and heap opprobrium upon its purveyors. By a strange inconsistency, whenever an attempt was made by the Companies to improve or extend their works, it met with most determined opposition from the very people who had been loudest in their complaints of the existing condition of things. The object, of course, was to "bear" the undertakings, in order, as it was hoped, to get them at something like an "old iron" price. The scheme signally failed; for the result of all the investigations instituted into the water supply of the Metropolis—whether by Royal Commissions or by Parliamentary Committees—was complete exoneration of the Companies from the aspersions cast upon them. The last Royal Commission appointed to consider this question—that which was presided over by Lord Llandaff—placed upon record the opinion that, on

the whole, the Companies had performed their duties to the public "satisfactorily and well." At the same time, having regard to the prospective requirements of the area known as Water London, they thought it was desirable that the water undertakings should be "acquired and managed by a "public authority."

The first part of this suggestion has now been carried into effect. The undertakings have been acquired, but at a price much higher than was expected. The awards already made amount to close upon £25,000,000 sterling, taking the lower figures in the cases where alternative sums were given. The present value of the property acquired is about £1,000,000 sterling less than this; and should the higher amounts awarded have to be paid as the result of the decision of the House of Lords, the £25,000,000 will be increased to about £37,500,000. Whatever the amount may be, however, there is every probability that the shareholders of all the Companies will follow the example of the West Middlesex, and accept 3 per cent. water stock at the rate of £109 10s. for each £100 of existing stock, in discharge of the amount of the award. This, according to a financial contemporary, will be equivalent to taking the new stock at £91 6s. 6d.; and it is regarded as a satisfactory bargain. It will remain to be seen what sort of a surplus there will be after the interest and sinking fund payments have been met out of the income the Board will receive. It is thought in some quarters that it will be twenty years before anything will be available in relief of the rates, which is the one great object the municipalizer has in view.

However this may be, the Board are now practically in possession of the undertakings, and they will have to conduct them, on behalf of the ratepayers, in the most efficient manner possible, so that if the rates are not relieved, as the hope is they will be, they will at all events not be heavier. It was a judicious provision of the Metropolis Water Act that the Board were allowed a period of eighteen months before they came into possession, as this gave them time to make the necessary preparations for entering into the new business, and to become acquainted with the officers of the various Companies, from whom they have obtained valuable information in regard to water supply. Their courtesy has been publicly acknowledged; and the Board, at their meeting on Friday, showed their appreciation of the capabilities of certain of the chief officials by placing them in charge of the district offices of the new body, which the Companies' chief offices have now become. Furthermore, they selected Mr. W. B. Bryan, the Engineer of the East London Company, as their Engineer-in-Chief. In making these appointments, the Board have certainly started well. They are a fluctuating body, and they know how much depends on the skill and ability of the permanent officials. Those just appointed have a thorough grasp of the duties they will have to discharge. In Mr. Bryan the Board have secured a gentleman of large experience in connection with the water supply of the Metropolis, who will be fully equal to carrying out any extensions of the existing works which future requirements may necessitate.

The Board are now, therefore, fairly started. Whatever may be their ideas as to the future, they will, for a few years at least, have to follow the lines laid down by their predecessors, who have handed over to them works and plant which embody the latest improvements in this department of engineering. The works of which their Chief Engineer has for so many years had charge furnish striking evidence, in the range of engine-houses at Lea Bridge, of a desire to adopt more modern machinery as it has been gradually introduced; and the same remark applies to the group of Companies on the banks of the Thames at Hampton and the rest. The Staines reservoirs only wait for the completion of certain connecting works to enable them to become a useful auxiliary to those now in operation; while their facility of extension was one of the features of the scheme which specially commended it to the notice of Lord Balfour's Commission. On the other side of the river, at Walton, the large reservoir commenced about three years ago by the Southwark and Vauxhall Water Company will provide the Board with additional storage to the extent of rather more than 1000 million gallons. They consequently commence business fully equipped with the results of their predecessors' experience. The people of London have been clamouring, through their representatives, for a change of management in connection with the water supply. We cordially wish them success in their undertaking.

THE GAS AND WATER STOCK MARKET.

THINGS still keep quiet and dull on the Stock Exchange. It is not easy to say exactly what is the ruling factor that produces this phenomenon; but certain it is that there is a general sort of feeling which tends to depress them. Last week, there was an additional weight in the dearness of money. This is a matter one is prepared for at the end of the half year; but it began to show itself rather early. The two most engrossing items were the Transvaal Loan, which went very satisfactorily for the borrowers, and the dealings in view of the Water Companies being paid off in stock. As the figure at which the new stock was offered to the Companies was equivalent to 91⅓—a price well below the value of such a security—the consequence was a quick move to buy the Companies' stocks which commanded such a favourable rate of exchange. We revert to this matter below. In the Money Market, there was a steady hardening almost up to the close, when the stress relaxed somewhat. Discount rates also took a similar line. Business in the Gas Market was a great deal quieter, tailing off at last to next to nothing. But the steadiness was something remarkable; for, after a debenture stock had moved up a point on the opening day, not another change of any sort was made throughout all the rest of the week. And in the Provincial Exchanges, too, there was only one change in quotation. In Gaslight and Coke issues, the ordinary was very moderately dealt in. The lowest figures marked were 92½ on Monday; and the closing bargain on Friday was at 93⅜. This seemed good enough to warrant a rise; but the quotation was left standing. The secured issues were comparatively more active; and they were firm generally, the debenture stock advancing a point. Dealings in South Metropolitan were moderate; and the prices at which the ordinary changed hands ranged from 125 to 126½. In Commercials, there were two or three transactions in the 4 per cent. at nearly top price. The Suburban and Provincial group were very quiet and inanimate. The only movement was in Sheffield "C," which receded a point on the local Exchange. Transactions in the Continental Companies were very restricted; and the prices marked gave no indication of any approaching change. The remoter undertakings were featureless. The Water Companies were considerably agitated; and if they may be considered as having terminated their existence on "the appointed day," then it may be said that, from a Stock Exchange point of view, never did they exhibit greater vitality than at the moment of dissolution. On the last day or two, all the stocks—ordinary, preference, and debenture—had advances of from 13 points downwards, according to their prospective value; the rises for the week being as follows: Chelsea ordinary, 7½; preference, 13; 4½ per cent. preference, 8; debenture, 5; East London ordinary, 5; 4½ per cent. debenture, 3; 3 per cent. debenture, 2; Grand Junction ordinary, 3½; 4 per cent. debenture, 6½; Kent ordinary, 7½; new, 9½; Lambeth ordinary, 8; 7½ per cent., 10; debenture, 5; New River ordinary, 5; debenture, 4½; Southwark ordinary, 5; 7½ per cent., 10; preference, 4; West Middlesex ordinary, 3½; 4½ per cent. debenture, 7; 3 per cent. debenture, 2. The only change in Gas was a rise of 1 on Monday in Gaslight debenture.

A SUGGESTED SCHEDULE FOR GAS TESTING.

BEFORE consigning the report of the Departmental Committee of the Board of Trade on the Testing of London Gas to whatever future may be reserved for it, it will be of advantage to the cause of clearness, if a succinct positive statement is set out of what the Companies would be likely to agree upon among themselves, as a fair basis of such photometrical testing of their gas as would ensure the public getting the proper value for their money, while affording to the manufacturer a desirable degree of flexibility. Our statement is, of course, quite unofficial. It would be absurd to expect the London Gas Companies to pin themselves to anything more definite, of this nature, than such a virtual agreement as transpires from the evidence of their spokesmen before the Committee. In view, however, of what has been made public as to the profound dissatisfaction which was caused by the findings of the Committee, on the single point of the "nomenclature" of gas by candle power, it will be as well to state what would probably satisfy the gas industry. It is suggested, therefore, that for the time being—which is admittedly a time of transition—the following schedule would be fair to all parties.

1.—Gas to be supplied at a price or prices referring to a standard of illuminating power of the luminous flame.

2.—The illuminating power of the gas supplied by any statutory company shall be the luminous intensity of the flame of the prescribed burner, measured in the horizontal direction, and expressed in terms of standard candles calculated for a consumption of 5 cubic feet per hour.

3.—For gas required to be of an illuminating power of 20 candles and upwards, the prescribed burner shall be of either the flat-flame type without chimney, or the argand type with chimney, as may be preferred by the undertakers.

4.—For gas required to be of an illuminating power less than 20 candles, the prescribed burner shall be of the argand type, with a suitable chimney.

5.—The prescribed burner for gas of any reputed illuminating power shall be the most effective burner for burning such gas with the highest degree of luminous intensity, either to yield a flame of the required candle power, or for a consumption of gas at the rate of 5 cubic feet per hour, and be suitable for use by the consumer in the same way, without special accessory appliances.

6.—The gas company shall from time to time declare to the testing authority the standard burner they elect to use, whereupon a sufficient number of such burners shall be stamped by the Standards Department of the Board of Trade, and supplied at the expense of the company to the testing station or stations, and be used for this purpose until further arrangements come into force, which shall not be at a shorter interval than three years.

7.—In case the gas company shall prefer to use as the prescribed burner the "London" argand No. 1, now the sole testing-burner sealed by the Standards Department, which has provision both for a chimney 2 inches in diameter and for one $1\frac{3}{4}$ inches diameter (outside measurement), the smaller sized chimney may be used for gas of 14-candle power or less. The chimney is to be 6 inches long. In making a test with this burner, the gas shall always be turned on as high as possible, short of the flame smoking or tailing over the top of the chimney, and this is to be taken as the proper and most effective use of the burner, as a consumer would use it.

8.—The statutory illuminating power of the gas is to be calculated proportionately from the actual luminous intensity developed from the quantity of gas burnt to produce the best effect as aforesaid, for the standard consumption of 5 cubic feet per hour, corrected and reduced to 60° Fahr. and 30 inches barometer.

9.—The pattern of photometer used, and the standard of light employed, shall be such as are for the time being prescribed by the Referees for testing London gas.

Other details might be set out; but the foregoing will strike most gas makers as fairly covering the debateable ground. To pick out certain particulars from the list as being rather more "favourable" than usual to the gas, would be to beg the whole question of the object of statutory photometry. No such treatment of gas can be more "favourable" than it deserves, both in common justice and specifically under the organic statute of 1868. "A just measure" is what the eternal law of fair dealing demands, with the implied condition that it be fairly used. No apparatus, such as a burner, can add to the substance it burns any adventitious virtue; but it can easily depreciate it. A pint pot cannot be more than filled; but it can be underfilled.

In point of fact, the working rule given here is actually in force in certain cases; there being gas undertakings working today under test by means of burners expressly made for them, to suit the make and quality of gas they find it most advantageous to vend. The Wandsworth Company is an example of the class—perhaps the best known, but not by any means singular in this respect. The Salford Corporation are in the same case. We mention these two leading illustrations of the principle of our fifth condition. There are other undertakings, companies and local authorities, which are at liberty to use the "London" argand No. 1 to the best advantage. To complete the list, dealing only with gases of the lower grade, requiring what the Committee oddly stigmatize as the "anomalous" use of an argand burner to test them satisfactorily, some companies have their product burnt at the rate required to give a 16-candle flame; while very many others—the great majority in number—must burn their gas actually at the 5 cubic feet rate. It is plainly outrageous to ignore the different conditions under which all these gas undertakings stand as regards testing, when comparing the prices they charge the public for their gas. Again, some of it is coal gas enriched with cannel; some coal gas not enriched at all; some a mixture of coal and carburetted water gases; some has benzol in it; some has (or had) petroleum spirit enrichment. Certain samples burn with a long flame, very apt to smoke; others have short flames, which do their work in a small compass. What justice demands is plainly some trustworthy common standard of value for this commodity, analogous (in bearing on the manufacturer and purchaser) to the gas-meter, which measures the quantity of gas of all sorts indifferently.

There might obviously be a variety of standards of value applicable to the gas supply of towns, as it is done at the present day. The Committee have mentioned a flat-flame test and a calorimetric test, both of which possess a certain degree of interest for the technician. But it is enough to say of them that they have no statutory or commercial standing. Illuminating power is the sole criterion of value in exchange for money recognized by law and custom; and it is this with which we are now dealing. It was the business of the late Departmental Committee to discover the common standard by which this quality of gas supply might be tested, for the protection of the buyer and the vindication of the vendor; and this they failed to do, being misled by a logomachy. The existing confusion of standards and methods of using them, already mentioned, is chargeable with inequalities in the commercial relations of gas companies occupying adjacent districts, which would not be tolerated for a day in respect to any commodity by which the community sets store, and judges for itself, such as beer. The price of some of the gas sold in the vicinity of the Metropolis is actually 3d. per 1000 cubic feet higher than it need be, entirely because of the invidious way in which it is required to be tested for illuminating power. On the opposite side of the street there is a cheaper gas, tested in a more sensible fashion. This is not the proper way of doing business, of course; but it is the effect of parliamentary regulation of the trade in gas, influenced by the narrow views of gas testing imposed on local authorities by interested or pedantic photometrists.

Some local authorities, no doubt, have acted in what they believed to be the best interest of their districts in screwing up the gas company, under parliamentary pressure, to supply the highest quality of gas which it was possible to get prescribed, whether in name or by inference from the testing conditions. Nowadays, however, the same authorities are dissatisfied when they compare the price they are charged for this gas with that asked for gas of the same description elsewhere. It is not a question, be it observed, of what is the best quality of gas for the locality, having regard to the available materials of manufacture. That is another story, not to be confused with the question of photometry. The point here is the photometrical practice only. It is plainly indefensible that any prescribed quality of gas, as to illuminating power, should mean different things in different places. Enthusiastic partisans of the movement for the supersession of the Imperial by the metric system of weights and measures wax sarcastic over the variety of British ounces, pounds, and stones employed for different commodities and in various parts of the same country. What would they say if they knew that Parliament requires 14-candle gas in one district to be as much as 25 per cent. out of keeping with 14-candle gas in the next parish; and that leading exponents of British Science approve of the inequality? Imagination fails before the parallel suggestion, that beer brewed in Putney should be sold under a different Excise standard from the fluid bearing the same description which happens to originate in Wimbledon.

For all the foregoing reasons, and others which it would take too much space to go into now, we venture to conclude that there is no sound ground of principle on which the statutory photometry of gas can be rested, other than that indicated herein, which, it must not be forgotten, is that marked out as plainly as possible by the Act of 1868. All that the gas industry demands is a just standard of value for its staple, justly applied. No juggling with words, or hair-splitting between what is mere nomenclature and what is description within the meaning of the law, is worth a moment's consideration beside the verities of the gas industry. If we have mistaken the latter, there will be no lack of correction; but our schedule will probably be deemed imperfect rather than erroneous, if the meaning has been properly expressed.

ELECTRIC LIGHTING MEMORANDA.

The Parliamentary Campaign over the Bermondsey Clause—Victory of the Principle—A New Model Clause.

THE parliamentary campaign with respect to the Bermondsey Clause has ended, for the session, in a victory for the principle, as will be seen by our "Parliamentary Intelligence." It is necessary to make this point quite clear, because a little uncertainty appears to exist in some quarters as to the rights of this matter. This is not to be wondered at, seeing that it is a business for Counsel, and the original clause was inserted in the Bermondsey Borough Council Order of 1902, on the representation of Mr. Balfour Browne, acting on behalf of the South Metropolitan Gas Company. This year the same eminent Counsel, briefed by the Corporation of Maidenhead, as reported by an electrical contemporary, "had no difficulty in showing that the clause might be a hindrance, and could hardly be a help towards straightforward trading on a profit-making basis." This is what comes of having Counsel who can plead either way with equal persuasiveness. The Duke of Northumberland, however, who had a bunch of these Bermondsey Clauses to deal with, knows his Balfour Browne, and was content to make a point of departure of Counsel's assurance that the Board of Trade have such an aversion to the clause that they have consistently refused to insert it in Provisional Orders. The Duke thereupon invited the Board of Trade to explain their policy in this regard; and accordingly Mr. T. H. W. Pelham, of the Department, attended, and told the Committee all about the matter.

As might be supposed, the objection of the Board of Trade to the clause as originally drafted is based on the view that a local authority, like all other undertakers, must be prepared to face an initial loss in the expectation of eventually making a profit. This, of course, is right and reasonable; but the Board of Trade, in their official innocence, seem to forget that nine local authorities out of ten who go in for electric lighting are not only fully persuaded that they will make profits, but also that the profits will be immediately realized. The principle of the Board of Trade is doubtless sound; but it would not commend itself to more than a small fraction of the municipal applicants for Electric Lighting Orders. On the other hand, the true principle of the Bermondsey Clause, especially as further elucidated by the Marylebone amendment of it passed this session on the representations of the Gaslight and Coke Company, is one that ought

to commend itself to the acceptance of the Board of Trade as well as of Parliament. It is simply that local authorities going into trade shall not be at liberty to subsidize their undertakings out of the rates, either directly or indirectly. This is the whole thing. Everything else is detail. Happily for the reputation of the House of Lords as the businesslike Chamber, the Duke of Northumberland's Committee have grasped the central principle, and decided upon a form of the clause which should adequately protect the ratepayers. After a period of grace of five years in the case of a new venture, and three years in the case of an existing undertaking, and thenceforward triennially, the local authority must, so far as is reasonably possible, revise the prices charged for electricity "so that no loss shall be incurred by the ratepayers on the undertaking." If this requirement is satisfied in fact as well as in appearance, no ratepayer will have any legitimate reason to complain. The "Electrician," noticing this decision, observes that the gas companies do not gain very much by it. They do not want to gain. All they want is not to be injured in their business by municipal rivalry carried on at a loss, which they, in common with other ratepayers, would be compelled to bear. If the Board of Trade accept the Duke of Northumberland's clause as a model, and apply it to all Municipal Electric Lighting Orders, well and good. If not, gas companies will be under the painful necessity of opposing every Confirmation Bill in Parliament, with the object of procuring the insertion of the clause. Electric light companies will be gratified also by the clause, because it will settle for ever the myth that municipal electricity is always cheaper than the product of private enterprise. No legitimate electric lighting undertaking will be hurt by the new model clause, which will only destroy an illusion that has to be supported by false statements and cooked accounts wherever it exists.

THE REPORT OF THE BOARD OF TRADE TESTING COMMITTEE.

By Jacques Abady.

I have refrained from making any communication to you with regard to the recommendations of the Board of Trade Committee on Testing, not because of any uncertainty of view, but because I was waiting to see if anybody would "spot," *inter alia*, the glaringly false assumption as to what the figure would be for 14-candle gas under the "Neo-Nomenclature System," for which I hope, in the interest of public sanity, the Board of Trade hold a patent. I am pleased to find that so experienced a photometrist as Dr. Harold G. Colman has spoken out on this matter; and now that he has done so, and confirms with no uncertain voice what I, with equal emphasis, stated at the North of England Association, I trust you will find room for the few remarks I have to offer.

Before dealing with the subject, I should like to say, parenthetically, that there is one false assumption which has already been mentioned on several occasions—namely, that the adoption of the 5-foot rate would mean putting the table photometer on the "scrap-heap." This is not so; the modern table photometer enables tests to be made at the 5-foot rate.

There is absolutely no doubt whatever about the truth, as comparative values, of the figures I publish in the table referred to by Dr. Colman. I do not quibble over a tenth of a candle or so; but, speaking broadly and generally, those figures represent facts. This being so, what should be the policy of those interested in gas undertakings? I say (and here I diverge from Dr. Colman's view) that there should be no half-and-half measures, no meeting the thing half-way by accepting as a sort of compromise a 16-candle flame with varying chimneys, or anything of the kind, because such a system is almost as illogical as the 5-foot rate, and almost as unjust. I am quite certain that the policy for gas authorities to adopt (not only in their own interests, but above and before all in the interests of uniformity and common-sense) is the advocacy—not merely by despairing speeches or newspaper articles, but by concerted action—of the amendment of the Gas-Works Clauses Act and every Special Act in which the argand burner is used, and the substitution for the various systems that would then be swept away *of a uniform and universal test by the "London" argand burner with a 6-inch by 2-inch chimney with a full flame.*

The following must be borne in mind:—

1.—That, on the face of the Board of Trade report, there is not apparent any bias or partisan spirit, but only an exceedingly unfortunate desire to burke the main issue, and to set up a thing which is "without form and void."

2.—That the photometrical test, if performed by means which treat all gases with equal fairness (not with equal *unfairness*), does afford a really scientific guide to one of the physical properties of gas, just as certain, just as useful, and just as mensurable as, for instance, the knowledge of the specific gravity of gas.

3.—Taking the analogy between the specific gravity a little further, it is clear that what the Committee have done is to recommend such a system of photometry as would be equivalent to saying, in the matter of specific gravity, that this in the case of one gas should be measured in terms of water, in another gas in terms of air, and in another gas in terms of oil. This is not a perfect analogy; it is very difficult indeed to find one. But surely when a body representing the (presumably) quintessence of scientific authority in England says that you shall valuate a thing by a term which admittedly does not represent its value, then, even to the "man on the 'bus," how exceedingly feeble this recommendation is.

4.—That this question raised by the Board of Trade Committee, which seems so important, and is so important to us in London, is comparatively unimportant (at present anyway) to the majority of gas makers in the United Kingdom, because—

5.—Nine-tenths of gas makers who have testing clauses test under the Gas-Works Clauses Act, and consequently at the 5-foot rate, and not only at the 5-foot rate, but with such an obsolete standard as candles.

6.—The existence of the facts stated in point No. 5, which cannot be denied, is a material and powerful argument in favour of the recommendation of the Committee; but nevertheless it does not make that logical or useful in any way, only more difficult to fight.

7.—The object of a clause for testing by photometer is not only to afford a scientific measure of one of the physical properties of gas, nor to simply enable a public control to be exercised over the quality of the gas supplied, but is, or should be, also to enable a fair comparison to be made between gas in one district and gas in another; and it must be borne in mind that it is only by such comparison that a guide is afforded to the deliberation of a Parliamentary Committee in adjudicating an application for powers or an amendment of powers.

8.—It will be seen how, if this recommendation is adopted, though it would only, at present, affect a comparatively few companies, it would *ricochet* on the minds of a Parliamentary Committee who were judging an application from a Provincial company to reduce the power of the gas from 16 to 14 candles. What sort of test could they recommend? Is it not obvious that the presence of this recommendation as a precedent is doing nothing more or less than penalizing the enterprise or the scientific advancement in methods of gas manufacture?

9.—I therefore assert, even at the risk of being considered dogmatic, that a proper photometrical test has a great measure of utility; but the only test which would be treating all gases with equal fairness is the full-flame test.

10.—Though it has often been asserted, and I have often stated it myself, that a calorific standard would be of use, it most emphatically does not mean what the Board of Trade Committee recommend—viz., the simple recording of the calorific power of gas. This affords very little comparative ratio of different gases. A calorific standard would be useful when we have made up our minds that gas is a fuel, and when, from the entrance of coal into our gas-works to the sending out of the finished gas, coke, tar, and bye-products, we recognize that we are making fuel, and then place our gas-making system on this basis—altering our working in order to decrease the percentage of heat units lost in manufacture, and expressing all moneys we pay, and all moneys we receive, in terms of heat bought (as coal) or heat sold (as gas or bye-products).

This, however, is a large subject. It could be well dealt with to an extent that would fill this number of the "Journal."

I hope these few remarks will make clear, even to the least interested, how this recommendation of the Board of Trade Committee must, if adopted, hold up to ridicule the whole of the gas profession in England in the eyes of foreign scientists; but I can hardly think that such a recommendation can ever be allowed to come into force.

I have spoken of the necessity of concerted action. It is almost as futile to mention action as to write articles on such a subject; but I shall be glad, should you or your readers desire it, to point out on another occasion how such action can be put into being in a practical manner.

Gas v. Electricity for Public Lighting at Canterbury.—When referring to this matter last week (p. 841), we quoted from the "Kentish Mercury" some figures bearing upon the rating of the Electricity Department. Our contemporary stated that on a capital of £54,028, the rates paid amounted to £237 16s. 7d. To the last figures there was appended an explanatory note as follows: "The Electric Department would have to pay £288 18s. 10d. *now* in rates and taxes, if rated on the same footing as the Gas Company"—the latter amount being, as we said, £50 more than the former. The Accountant of the Canterbury Gas and Water Company (Mr. W. A. King) points out that the word which appears in italics was a misprint for "more." Consequently, the amount the department would have to pay would be £288 18s. 10d. *plus* the £237 16s. 7d., or £526 15s. 5d. if rated on the same footing as the Company. This makes the case a great deal worse. It is not a little curious to note that our contemporary's criticisms opened with some scathing remarks on several "glaring errors" in the accounts of the department, which it was thought could not be "attributed to the printer." Possibly in this as in many other cases they were due to a combination of forces in which both author and printer had a share.

FIG. 1 (1826).

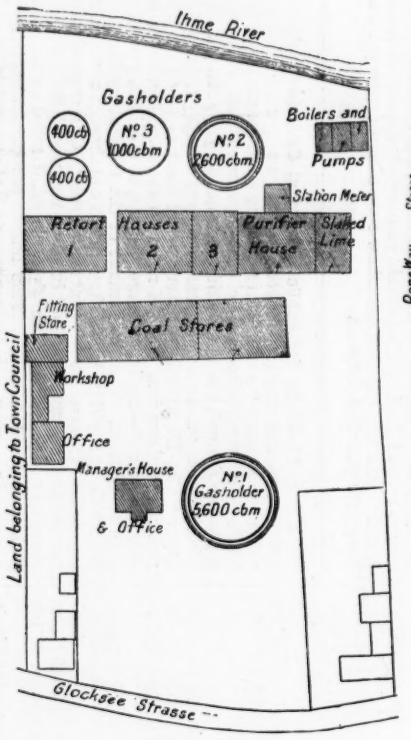


FIG. 2 (1860).

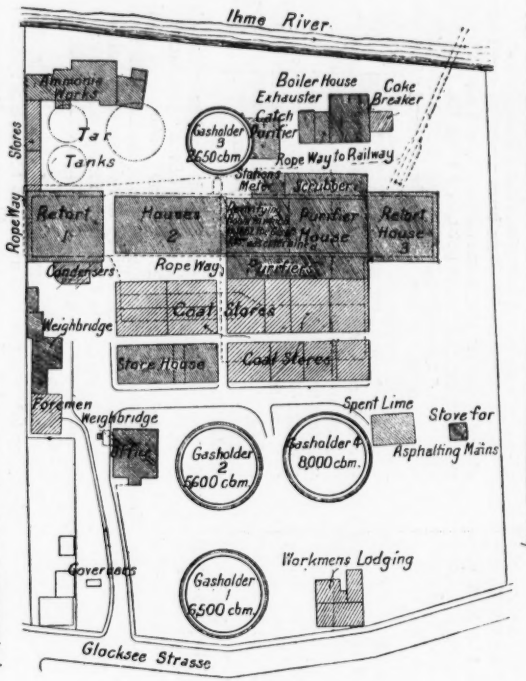


FIG. 3 (1882).

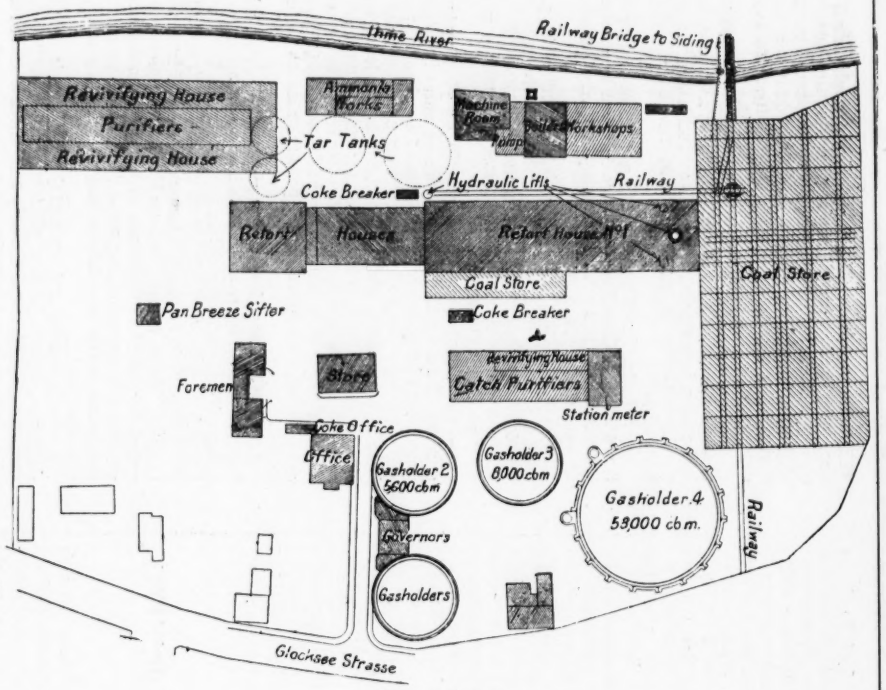


FIG. 4 (1904).

THE GROWTH OF A CONTINENTAL GAS-WORKS—HANOVER.

IN Great Britain, the history of the gas industry, taken on the whole, is not marked with any greater untoward events than rises in the market prices of raw materials and occasionally labour disputes. When observed from the Continental standpoint, the march of progress across the North Sea and English Channel is looked upon as having been a peaceful one for the industry, when compared with the retarding influences and upheavals to which certain of the Continental gas undertakings have been exposed. The visit to Hanover last week of the German Association of Gas and Water Works Engineers has brought this prominently into view; the history of the gas-works there supplying a very interesting illustration. Notwithstanding the many drawbacks, this undertaking—especially during the past quarter-of-a-century—has had a pronounced ascent in prosperity, notwithstanding that the works have been consistently worked on lines which some may call old-fashioned, but which lines are not found in the resulting costs to be beaten by many, if any, other Continental undertakings of modern design and equipment. There is the fact. It is seen between the lines of the address delivered by the President of the German Association (Herr L. Körting, the Engineer of the works), as published elsewhere, and more will be found in this account of the undertaking from its inception to its present position.

It was on Dec. 21, 1824, that Major-General Sir William Congreve, as Chairman of the Imperial Continental Gas Association, received from the Minister the exclusive privilege of lighting the residential town of Hanover for twenty years from the 1st of July, 1825. The Town Director Rumann signed the conditions under which the Association undertook the gas lighting of the old and new town. The Association were to supply a light which, in comparison with that previously used, was to be at least as 2 to 1, and were to receive for this the price hitherto paid of 1850 talers [multiply by 3 to get the amount in shillings] for the old town and 900 talers for the new town. The number of gas-lamps was to be at least 300; and at most 350. The lighting was to commence on the 1st of July, 1825, in the chief streets; and for the side streets a delay after the 1st of July, 1826, was allowed. But as the concession for the erection of the gas-works on the present site was only granted on March 25, 1826, by the (then) Royal Landdrostei, the lighting scheme was only commenced in the spring of 1826. Of private lighting no word is mentioned in this contract, nor were there any stipulations with regard to the quality of the gas. Under date of July 29, 1828, a supplementary contract was approved, which increased the amount to be paid for lighting to 3000 talers, and made it a condition that the public lights should in the future have a height of 4 inches. The burners were so-called three-hole ones, which, as may be imagined, gave a very moderate light.

When the first contract had run its course, negotiations for a new one were commenced, and occupied a long time, Only on

August 15, 1851, was a new contract signed, which took in the Ernst-August-Stadtheil portion of the town in the lighting area, and increased the number of lanterns to 434, at the price of 3719 talers; the condition that the flames should be 4 inches in height being maintained. But for any further lanterns, the price was fixed at $8\frac{1}{3}$ talers. There was still no question as to private lighting, but the Association bound themselves not to increase the then existing prices. What these prices were is not mentioned in the contract; and of the quality of the gas just as little is said. The duration of this contract was to July 1, 1871.

In 1859, the Agent of the Company (Dr. Schneemann) carried through the prolongation of the contract up to the year 1900. On this occasion, a conflict arose between the Magistrates and the Burgomaster. The Magistrates agreed to the contract by a small majority; but the Court of Aldermen unanimously declined it. The Royal Landdrostei again had to decide the matter, and sided with the Magistrates. In this new contract for the first time, gas-meters are mentioned, which (soon after 1851) had been gradually introduced. With regard to the quality of the gas and its purity, conditions were brought into existence which, of course, in respect of inconvenience left nothing to be desired. For example, it was demanded that the gas should contain so little sulphur that litmus paper would not be coloured or reddened on the burning of the gas. The price of gas for private lighting was also now fixed in this contract—viz., 5s. per 1000 cubic feet English, which compared with a price of 17·586 pf. per cubic metre. In 1887, the Association commenced negotiations with the town for a prolongation of the contract; and, thanks to the insight and energy of Senators Tramm and Entgegenkommen, with the assistance of Mr. R. S. Gardiner, the (then) Secretary of the Association, on the one hand the mistrust of the town was conquered, and, on the other, the town obtained extraordinary concessions as the price of the prolongation. In return for the obligation to pay a subsidy of 3 pf. for each cubic metre of gas sold, to lower the price of gas for lighting throughout the town to 16 pf. per cubic metre, and to 12 pf. for cooking purposes, and, on the conclusion of the contract, to transfer the works to the Municipality in perfectly good condition, the contract was extended until the 1st day of July, 1925. At last, too, scientific conditions with regard to the quality of the gas were introduced. These were: (1) In 100 cubic metres of gas, there should not be more than 50 grammes of sulphur, 9 grammes of ammonia, and 2 volumes per cent. of carbonic acid. (2) The gas made was to be completely purified from sulphuretted hydrogen, so that a paper made damp with sugar of lead should not be coloured after being exposed for one hour to a stream of gas. (3) The illuminating power from 170 litres burning in a street-burner (a specially prescribed slit burner) was to be equal to 16 English standard candles. The contract with the town of Linden is practically the same as that with Hanover.

This short statement shows the conditions on which the city of Hanover has been lighted during nearly eighty years; and now

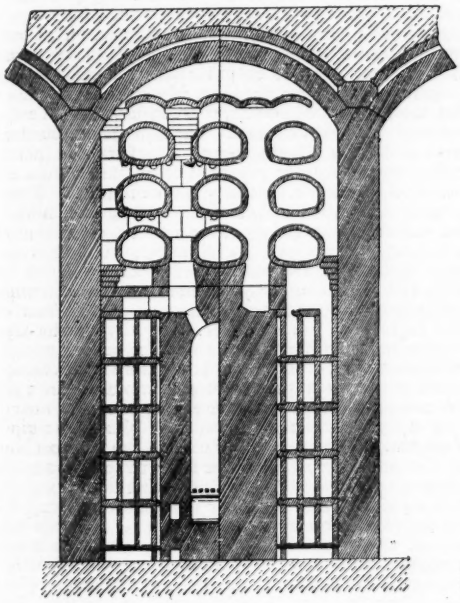


FIG. 5.

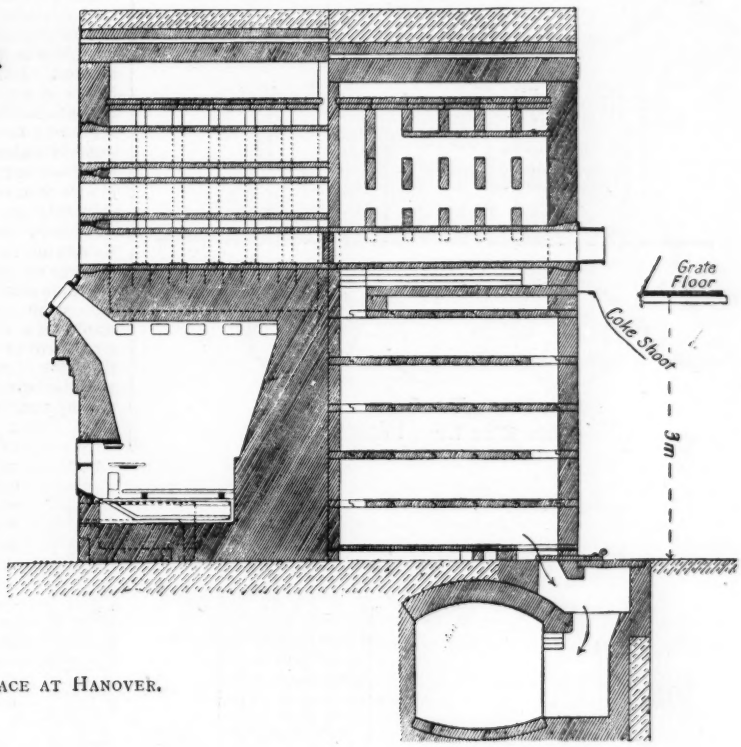


FIG. 6.

TYPE OF FURNACE AT HANOVER.

not less interesting will be found an account of the works themselves from their inception. They were originally built in 1826 by two young Englishmen—the two talented brothers George William and Leonard Drory; and this shows how long this name honoured among gas engineers has been associated with Continental gas-works. George went to Berlin in 1827, in order to erect the gas-works there for the Imperial Continental Gas Association, and Leonard remained behind as Manager of the Hanover works. When he was nominated in 1833 to the management of the Berlin works, the merchant Ernst Körting was appointed in his place. Ernst Körting had already had something to do with the lighting of Hanover, for he had passed his pupilage in the business of Wilhelm Haase, who was originally Oil Contractor for the lighting of the city. The Association, who went into combination with Haase, knew Körting in this way, and introduced to him the management of the Hanover Gas-Works. On his retirement, his eldest son Leonard was nominated as his successor, while his youngest sons Berthold and Ernst founded the world-famed business of Körting Bros., and brought it to a high state of perfection. The first apparatus which they completed in 1873 was the steam-jet exhauster for the Hanover Gas-Works. It is almost needless to say that the firm have immense works at Hanover now, so large indeed that the place where they are situated is called Körtingsdorf. Before large gas-engines commonly existed, they made one of 250-horse power for the Antwerp electric station of the Imperial Continental Gas Association; and, of course, they are famous the world over for their steam-jet exhausters.

Now a few words as to the raw material used, and manner of dealing with it, during the history of the works. At first coal from the Bückeberge (Stadthagen, Obernkirchen) was employed. It gave fine, clean coke, but poor gas. Gradually coal from the Deister Mountains, which lie between the Weser and the Seine, was used. This, contrary to the former kind, gave very good gas, but remarkably bad coke. The peasants of the neighbourhood brought the coal in their light waggons to the yard. In 1859 began the use of Westphalian coal; the first being brought by carts from the railway. In 1876, a wire-rope railway was erected, which carried the coal from the Küchengarten station into the coal-sheds, and into the retort-house. At that time the method of bringing hanging waggons round a curve was not thoroughly understood; and therefore the transport by this means was costly and was governed a great deal by circumstances. When in 1892, a wire-rope railway no longer sufficed a proper railway from the Küchengarten to the gas-works was laid. This is $4\frac{1}{2}$ metres above the level of the yard, and is carried by six supports over the coal-stores, so that at every point of the stores coal can be shot down. A turntable puts the line into communication with the railway which runs alongside the retort-house, in order to deliver the coal either to the coal-breaker or immediately on the spot in the retort-house where it is to be used. A second turntable is used for shunting the coke-waggons, which are loaded on another line the other side of the retort-house.

The general increase of the works is shown by the four block plans—viz., 1826 (fig. 1); 1860 (fig. 2); 1882 (fig. 3); and 1904 (fig. 4). The second of these shows the inefficient disposition of the purifier-house, which was gradually brought up to the highly

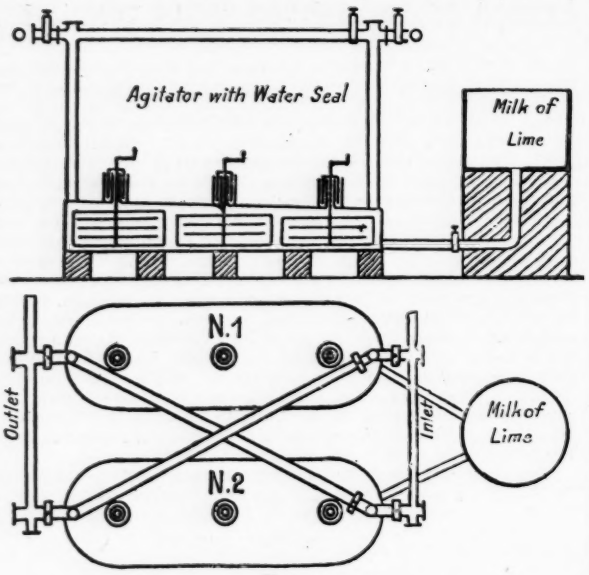


FIG. 7.

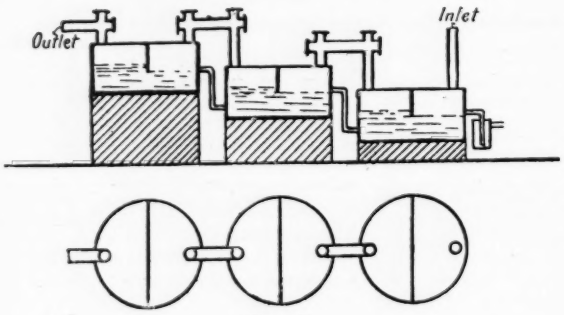


FIG. 8.

OLD WET LIME PURIFIERS.

unfortunate condition shown in the block plan of 1882. In 1890, under the direction of Mr. Corbet Woodall, a radical change was made, which effected the extension of 250,000 cubic metres daily without altering the disposition. The present building is sufficient for about 130,000 cubic metres per day.

The development of the gas plant may now be traced. The original retort-house contained nine benches, each comprising four small iron retorts. In 1841, clay retorts were first introduced. In 1854, all iron retorts had disappeared; and in 1857 benches of sevens were erected. In 1880, the first experiments with generator furnaces were made. In 1882, the first annual meeting of the German Association of Gas and Water Engineers held in Hanover found in existence seven generator furnaces—one of nine by Liegel; three of nines by Klönne; one Hasse-Didier, with one generator; and two Hasse-Didier with one common generator for the two. The experience was that the interior generators gave the best results; and the whole of the old and new furnaces were built on the Klönne method, but with an entirely altered system of regeneration. This year there exist 41 generator benches with nine retorts in each, one generator with seven retorts, and 30 direct-fired furnaces with six to seven retorts in each—making a total of 576 retorts. The manner in which the present benches are built is shown in figs. 5 and 6.

Respecting the purifying apparatus, in 1826 it was represented by one zig-zag pipe cooler of 150 mm. by 25 square metres cooling surface; three washers made out of a round box of $1\frac{1}{2}$ metres diameter with one valve, and a division-plate dipping into water (see fig. 8); and two purifying-boxes for wet lime, which never supplied gas free from sulphuretted hydrogen (see fig. 7). There was also a station meter of a daily capacity of 36,000 cubic metres. The year 1857 saw the introduction of purifiers (four boxes of 7·5 square metres) for dry lime, which to a far better degree effected the removal of sulphuretted hydrogen. In 1861, lime was displaced by oxide of iron. In 1873, jet exhausters were introduced by Messrs. Körting Bros. The first trial failed; for it was not then known that the gas must be quite free from tar before it came into contact with the stream of steam. Then, following on, came the introduction of the Mann and Walker scrubber; the coke column being of 12 metres, and later of 16 metres in height, and sprinkled with water, which met the stream of gas. Later the column of coke was replaced by wooden boards, and the introduction of the annular condenser. The year 1886 saw the introduction of a more perfect form of washer in the bottom of the scrubber. In 1893, water-pipe coolers were introduced, with numerous small pipes of 40 mm. diameter. In the year 1902, the Drory tar-separator and Dr. Beub's naphthalene and cyanogen washer were put into use. In 1903, the apparatus consisted of: One water-cooler of an average of 2 by 2 by 6 metres surface, with 500 water-pipes of 50 mm. diameter, in order to cool the gas to about 35° C.; one Drory tar-washer from 100,000 to 120,000 cubic metres capacity; one Bueb naphthalene and tar washer, of 4 metres diameter and $3\frac{1}{2}$ metres long, for 100,000 to 120,000 cubic metres of gas; and one condenser, consisting of six annular pipes, 0·90 metre internal diameter and 1·05 metres external diameter, and 15 metres high, with ten inclined connecting pipes—together 800 square metres cooling surface. The gas goes in one stream through the whole sixteen pipes at the same time. There are also two water-pipe condensers of the Clapham Bros. type, 2·10 metres diameter, and 6 metres high, with 500 square metres cooling surface; one of Mann and Walker's scrubbers,

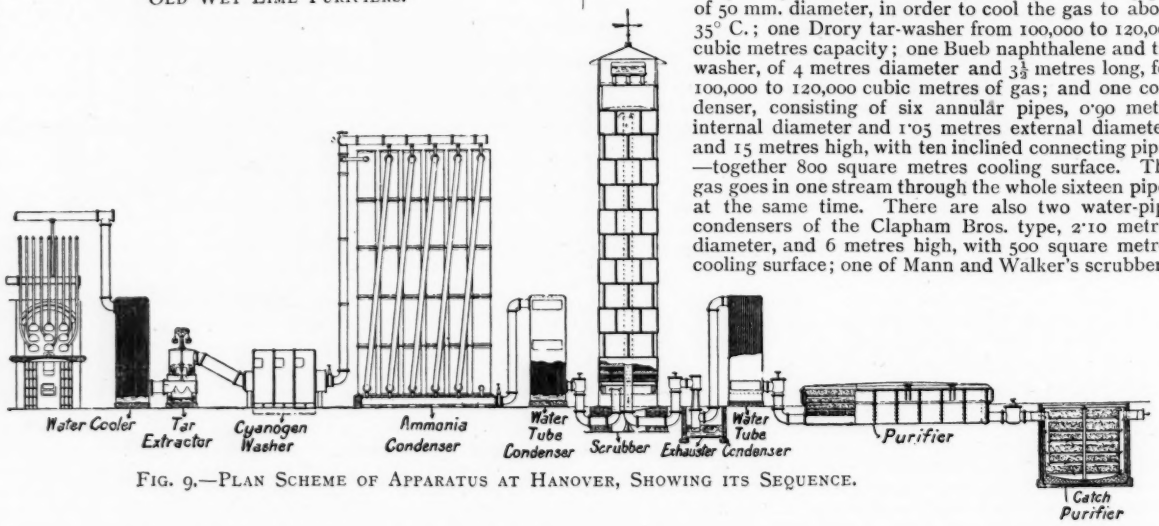


FIG. 9.—PLAN SCHEME OF APPARATUS AT HANOVER, SHOWING ITS SEQUENCE.

Consumption and Other Statistics for Characteristic Years in the History of the Hanover Gas-Works.

Year.	Yearly Consumption.	Yearly Increase in a Period of Years.		Tariff Lights.	No. of Gas-Meters.	Sold by Meter.				No. of Public Lights.	Consumption of Public Lights.	Annual Leakage.
						Lighting Gas.	Motive Power.	Cooking Gas.	Prepayment Meters.			
	Cub. Metre.	No. of Years.	Cub. Metre.	Cub. Metre								
1826	350,000	—	—	125,000	—	—	—	—	—	300	150,000	50,000
1851	754,000	25	16,000	470,000	—	346	—	—	—	368	184,000	85,900
1866	3,572,000	15	188,000	202,000	—	2,240,000	—	—	—	1,024	512,000	561,855
1869*	3,934,000	3	121,000	107,000	—	2,660,000	—	—	—	1,192	596,000	502,248
1874	6,605,000	5	534,000	133,000	3,800	4,580,000	—	—	—	1,835	812,000	968,096
1879	7,140,000	5	107,000	167,000	3,935	4,950,000	—	—	—	2,760	1,190,000	713,509
1887	10,015,200	8	360,003	87,000	4,793	7,540,000	—	—	—	3,358	1,620,000	667,184
1891	13,800,000	4	946,000	66,000	8,925	8,757,000	700,000	1,170,000	—	5,023	2,350,000	536,124
1898	22,587,000	7	1,255,000	65,000	35,116	10,281,000	1,486,000	6,836,000	25,798	6,500	2,600,000	687,573
1930	27,731,070	5	1,028,814	44,140	57,742	10,580,160	1,432,216	11,040,669	782,648	8,264	2,600,813	904,083

* Franco-German War, following which consumption was largely increased.

2·7 metres in diameter, and 20 metres high, one of 3 metres in diameter and 20 metres high, and one of 1·3 metres in diameter and 20 metres high—together sufficient for 200,000 cubic metres of gas. Beyond these, there are three steam-jet exhausters, which are capable of dealing with 100,000 cubic metres of gas daily, and for each exhauster one water-pipe cooler; two sets of purifiers of four boxes, each of 90 square metres superficial area, and one set of four boxes of 45 square metres; one catch box, of 5 metres diameter, and six tiers of sieves; two station meters each of 54,000 cubic metres daily capacity, and one of 28,000 cubic metres per day—together equal to 136,000 cubic metres. A glance at fig. 9 will give a general idea of the sequence of the apparatus.

We now come to the development of the gasholders. In 1826, two were built, each of 400 cubic metres capacity; in 1846, one of 1200 cubic metres was constructed; and in 1855, one of 2000 cubic metres was put up. In 1859, one telescopic holder of 5300 cubic metres was built (in this year the two of 400 cubic metres were dismantled, and the tanks converted for tar storage). In 1864, one telescopic holder of 6400 cubic metres was constructed; in 1877, one of 9900 cubic metres (in this year the 1200 cubic feet holder was dismantled, and converted into a tar-tank); and in 1886, one single-lift holder of 18,000 cubic metres (in this year the 2800 cubic metre holder was dismantled, and converted into a tar-tank). The 1886 holder was not built in a house, as had been some of its predecessors. In 1890, the last-named holder was extended, and its capacity was increased to 34,400 cubic metres; making the total storage 72,000 cubic metres.

With regard to the distribution system, the mains extend as far as Laatzen, Ricklingen, Limmer, Stöcken, Vahrenwald, List, and Buchholz. In 1825, there were 20,000 metres of pipes, the largest diameter of which was 150 mm.; in 1903, there were 307,600 metres, of from 750 to 600 mm. diameter.

Perhaps the most interesting part of the history of the Hanover gas undertaking has now to be related. In the first twenty years, 1826 to 1845, there was very little progress. The tariff system made the use of gas appear to be expensive, and caused it to be used extravagantly. With the introduction of the gas-meter in 1851, a more energetic life began, which was not destroyed by the introduction of solar oil in 1856, and of petroleum in 1858. Political events and economical conditions had the worst effect. For instance, between 1866 and 1870, there was only a slight increase [this was the time when Hanover was conquered by the Prussians]. There was a considerable accretion of business between 1870 and 1874 [that was when the place was converted into a Prussian city]; but there was an extraordinary "set-back" up to 1879. After 1880, there was a regular and good increase up to 1887. In consequence of the prolongation of the concession on Jan. 10, 1888, the price of gas was decreased from 17⅞ pf. to 16 pf., and the price of cooking, heating, and power gas to 12 pf. The use of gas then increased very rapidly, and that for cooking purposes especially made great progress. In another peculiar way the consumption for lighting purposes was affected—that was, by the introduction of Mid-European time. Electric lighting also took shape about this period; and in the case of large consumers—theatres and influential manufactories who could themselves produce electricity—this light would probably have driven gas lighting entirely out of the field, if the Auer light, giving a greater illuminating power at less cost, had not proved itself so much more advantageous. But as the incandescent mantle requires so much less gas than the burners formerly used, the quantity of cubic metres consumed did not increase in proportion to the augmentation in the number of lights. In the five years from 1898 to 1903, the use of gas only increased by about 300,000 cubic metres; while the use of gas for cooking purposes had increased by 4,200,000 cubic metres. In the year 1898, prepayment meters were introduced, by which gas is supplied for both cooking and lighting at a uniform price of 17⅞ pf. per cubic metre, inclusive of meter hire and rent of fittings. The 782,648 cubic metres of gas sold through automatic meters in 1903 was mostly used for cooking purposes.

This historical sketch of a gas undertaking that has existed through four-fifths of the past century may be concluded by referring readers to the interesting table on p. 938.

[Particulars about the trials now being made with new stoking machinery at Hanover will be found, with illustrations, in our account of the visit of the members of the German Association of Gas and Water Engineers to the works last Thursday evening.]

Transactions of the Society of Engineers.—We have received the volume of proceedings of the Society for the past year. It contains the Inaugural Address of the President (Mr. J. Patten Barber), and the papers presented at the monthly meetings, with reports of the discussions thereon. The technical matter is fully illustrated by plates. The President's gold medal was awarded to Mr. Douglas Mackenzie, for his paper on "Motor Transport for Goods;" and Messrs. R. J. Thomas and Albert Gay obtained premiums of books for their contributions. Interesting accounts are given of the vacation visits—an instructive feature of the Society's work. The useful subject-matter index has been brought up to date. The volume has been produced under the editorship of Mr. Perry F. Nursey, the Secretary.

PASSING OF THE LONDON WATER COMPANIES.

Last Friday was a memorable day in the history of the Metropolis. It marked the close of a long period of private enterprise in the provision of its inhabitants with a supply of one of the most important necessaries of life and health, and the opening of another in which the commercial spirit that had been a prominent factor in the carrying on of this work gave place to the more altruistic sentiment which is supposed to actuate the advocates of the municipal control of public undertakings. On the above-named day, the water-works of London and the business connected with them passed into the hands of the Metropolitan Water Board. By this transfer, the object of a half-century's persistent agitation was achieved—not, perhaps, exactly in the way many would have liked, but at all events to the extent of getting coveted property out of the hands of its possessors. In view of the extent to which the "Journal" has been identified with that property since the subject of water supply began to occupy its pages, the event cannot be allowed to pass without a few observations suggested by the reflection that it is absolutely without a parallel in the records of the water supply of the principal cities of the world.

For more than three hundred years London had been dependent upon its noble river and private enterprise for its water; for it was in the year 1582 that the Dutch engineer Peter Morrys obtained permission from the City Corporation to fix a wheel in the first arch of Old London Bridge and draw water from the River Thames. Later on, in 1613, private enterprise again, in the person of Sir Hugh Myddelton, gave London a more bountiful supply of water by means of the New River, when the municipal authority were too fearful of failure to undertake the work. Some years afterwards, the same spirit prompted the formation, in 1701, of the Kent Company, in 1724 of the Chelsea Company, in 1771 of the Association which developed into the Southwark and Vauxhall Company, in 1785 of the Lambeth Company, in 1798 of the Grand Junction Company, in 1806 of the West Middlesex Company, and a year later of the East London Company—the last as the development of the Shadwell Water-Works, established in 1681. Years before this, however, Myddelton had completed his pioneer work in providing the Metropolis with another source of supply than the Thames; and the rejoicings which accompanied the first turning on of the water are duly recorded in the quaint language of the chronicler of the time. A full meed of praise was given in a poetic effusion to the author of this great scheme. The poet recorded how—

> "a work so rare
> Onely by *one man's* industry, cost, and care,
> Is brought to blest effect, so much withstood;
> His onely ayme the Citie's generall good."

It has always been a matter of regret with us that the pedestal of the statue of this public benefactor which has been erected on Islington Green, at not a very great distance from the spot where his river comes to its "head," does not bear any other inscription than his name, the dates of his birth and death, and the names of the donors. It was worthily recorded on the bust of Benjamin Franklin that "he snatched the lightning from heaven." Surely, it would only have been doing justice to Hugh Myddelton and his achievement to have reminded posterity that "he brought water to London."

Since the accomplishment of this great work, what changes have taken place in the Metropolis, in the needs of its inhabitants in the matter of water, and in the plant and machinery employed to satisfy them. The New River furnishes us with a bountiful supply of water, though for some years it has ceased to flow into Clerkenwell in an open channel. The Lea is a useful auxiliary, and so are the wells sunk into the chalk; but the Thames, upon whose waters the Dutch engineer relied more than three hundred years ago, is still, notwithstanding many schemes brought forward for obtaining a supply from a distance, our chief source of water. Of the 215 million gallons with which Londoners were supplied daily in the past month, no less than 113½ millions were drawn from that river, but from a spot very far removed from the one which Peter Morrys selected for his operations. The growth of the business and population of London has made it necessary to take steps to keep the distributed water as free from contamination as possible; and with this view the intakes have gradually been moved higher up the river, until now they are all above tidal influence. The Lambeth Company was the pioneer in this movement about the year 1848; and as the result of the passing of the Metropolis Water Act, 1852, the Chelsea, West Middlesex, Grand Junction, and Southwark and Vauxhall Companies migrated from the neighbourhood of Chelsea to Kingston and Hampton. The latest addition to the works on which London will depend for water in the future has been located still higher up; the intake of the Staines Reservoirs Committee being some distance above the town. Something similar occurred on the Lea; the East London Company moving their intake to a point above tidal influence.

All these changes have involved a great outlay of capital, from which the consumers have benefited without being called upon to bear any additional expense. They have not only been supplied with a better article, but they have had it in greater abundance. Acting on their own initiative, the Companies determined that they would no longer supply the water as drawn from the

rivers; and they accordingly commenced the extensive system of subsidence and filtration which is so conspicuous a feature of the present works. To the Chelsea Company belongs the credit of taking the first step in this matter. Before these works were begun, the Thames water sent out for the use of the inhabitants of London was described as being "charged with the contents of more than 130 public common sewers, which rendered it offensive and destructive to health;" and it was suggested that the Companies should no longer take their water from so foul a source. This was three-quarters of a century ago. Now the filtered samples of water of the five Companies who draw from the Thames are stated by the Government Analyst (Dr. T. E. Thorpe), in his report for May, to have been of good quality; "the water in all cases containing only small amounts of organic matter." So much for quality.

With regard to the quantity of water now supplied, 218 gallons to one service, or 31 gallons per head—the average for the month of May—cannot be regarded as meagre. Let us compare it with the condition of things at the beginning of last century, taking the Company about which the most complaint has been made—the East London. In 1809, they supplied each house in their district with an average of 54 gallons of water daily; in 1902, the quantity was 183 gallons for all purposes, or 128 gallons for domestic use only, being 19·36 gallons per head of the population. In addition to this greatly increased bulk of water supplied per head, the closing thirty years of the past century witnessed the introduction and gradual development of the system of constant supply. The extent to which this has displaced the intermittent system is strikingly shown by the figures contained in the last annual report of the Local Government Board. In the year ending Dec. 31, 1902, 20,746 houses were added to the number provided with a constant service; bringing up the total to 958,377, or 95·9 per cent. of the houses supplied. In the whole of the district of the West Middlesex Company, which has rapidly extended into what were comparatively recently the rural suburbs of Cricklewood and Willesden, there is not a single intermittent service. This unquestionable boon has been accompanied by another—the introduction of the bath. What was at one time a luxury of the rich and well-to-do is now enjoyed by the artisan. All these things must contribute to the general healthiness of the population of London. We do not deny the existence of what Dr. Houston calls an "under par" condition among some of the inhabitants; we hesitate, however, to attribute it in the least degree to the water. On the contrary, we believe that a more liberal use of it, both as a beverage and for ablution, would raise the tone of many who now suffer from lowered vitality.

It only remains to consider the price which the public have to pay for the commodity which the Water Companies brought to their doors. It has been complained over and over again that the Companies were extortioners; that water was free as air, and that those who wanted it had the right to it. True, it was free—in the clouds, in the earth, or in the river. Those who required water could catch and store the rain, dig a well and draw up the water, or fetch it in buckets from the nearest pond or river. The Water Companies did not sell water, as the Chairman of one of them was careful to point out on a certain occasion. They were merely purveyors of water; and their charge was the remuneration they required for the outlay they had incurred in providing plant for the conveyance of it to all those who needed it. Never was the Yankee's definition of an engineer, as repeated by Mr. H. E. Jones in his brilliant Inaugural Address to the Institution of Gas Engineers a few days ago, more applicable than it was to the London Water Companies. "An engineer," said the witty American, "is one who does that for me for a few pence which I could not do for myself for a shilling." For about a penny a day the Companies provided the artisan with a supply of water sufficient for the requirements of himself and his family, and obtainable by merely turning a tap. Furthermore, they made adequate arrangements for the provision of water for extinguishing fires, for which service they did not receive a penny in return; and when it is remembered that the entire contents of a reservoir were once poured upon a great City fire, the extent of the tax upon their resources on these occasions may be easily appreciated. If the system of levying the charge on the rateable value of the property supplied was felt to bear somewhat heavily upon the dwellers in high-class property, to the advantage of those less favoured by fortune, it, at all events, allowed of an unrestricted use of water, which sale by measure might possibly have checked. It is a by no means insignificant feature of the conditions under which London has for so many years been supplied with water that the system of charging is in a measure a practical application of the utilitarian principle of Priestley and Bentham by a body of men who managed to gain for themselves—whether deservedly or not it is needless now to inquire—the unenviable character of "grasping monopolists." Whatever they were, they brought the water-works of London into their present excellent condition, they linked them together for convenience and to ensure continuity of service, and they hand them over to their successors with the confidence that they will be found what they have been represented to be.

A few days since, an electric wire beneath the floor of a wine and spirit merchant's shop, at Stockton, fused and set fire to the woodwork. Fortunately, the smoke was observed by a passer-by; and on the brigade being summoned the outbreak was subdued, but not before damage to the extent of £20 had been done.

GAS v. ELECTRICITY AND STEAM FOR PUMPING.

Owing to pressure on our space last week, we could only notice briefly the discussion on the paper read by Messrs. Meysey-Thompson and Lupton, on "Working Costs of Water-Works Pumping-Engines," at the recent meeting of the British Association of Water-Works Engineers at Hull. We therefore revert to the subject in order to bring out some points in regard to the comparative cost of gas, electricity, and steam as sources of motive power.

The discussion was opened by Mr. H. Ashton Hill, the Engineer-in-Chief of the South Staffordshire Water-Works Company, who remarked that he had a note upon the question of town gas. He had large power engines and small plant. He had two 2-horse power gas-engines; and the working of these in actual practice came out as follows: In 1900, the cost of pumping at this station per 1000 gallons against 100 feet was 5·33d., and it fell in 1903 to 2·137d. The explanation of this was that they had increased the total quantity of water pumped from 6½ to 17 millions; so that the members would see how elastic the figures were. He had also some figures from another small station, which he did not regard as an economical one. In the year 1900, the cost was 1·63d.; whereas in 1903 it was 0·74d. Against this, he had 0·143d. at another station. The first case was gas; the second and third were steam plants. With regard to electricity, he learned from the engineer of a large power supply station that if he got 8 lbs. per horse power per annum for nine hours a day he thought he was going to pay a dividend. He considered this rather a high figure. Electricity to large consumers was offered at 0·3d. per unit; it was offered to him at ½d. But in working out the figures for the particular station, he might say that he had tried all the small types of motors—from the electricity-driven centrifugal pump, oil gas, town gas, steam, down to the suction producer plant—that had been brought out, and of all these things he had come to the conclusion that in this particular case it would be far more satisfactory to keep to town gas at 2s. 6d. per 1000 cubic feet. This gas would need a lot of beating. As to other kinds of power, he had taken some figures of the cost per horse-power-hour from a paper by Mr. H. H. Clarke in "Engineering" and other sources, and they were as follows: Diesel oil-engine, 0·32d. to 0·59d.; Dowson gas, 0·29d. to 0·52d.; steam, 0·49d. to 0·89d.; and bituminous gas plant, 0·24d. The makers of the new suction plant claimed 0·1d., or 10-horse power for 1d.

Mr. Hill was followed by Mr. P. H. Palmer, of Hastings, who stated that in one station, even with gas at 3s. 6d. per 1000 cubic feet, he had obtained much better results than he had at another station where he used a small compound engine. With the same duty, gas proved very much cheaper.

As mentioned last week, some pertinent remarks on the subject were made by Mr. Crowther and Mr. C. E. Jones. The latter supported the opinion expressed by some of the preceding speakers that the authors of the paper had not done justice to the gas-engine; and he said that if he had had the opportunity of studying the paper before coming to Hull, he should have been provided with some statistical information as to the value of that motor. Speaking generally, however, he was perfectly satisfied that it was the coming power. It was solid fuel that blackened the atmosphere, shortened their lives, and gave encouragement to the washerwoman; and it was condemned on all hands. Liquid fuel, no doubt, was an improvement over solid; but the fuel of all was that which was in the gaseous form.

In the course of his reply, Mr. Meysey-Thompson said he thought that Mr. Jones was perfectly right in saying that the gas-engine was the motor of the future. At the same time, threatened men live the longest; and whether he would like to see only gas used was another question. The great point was, What was the cheapest fuel at the present time? He was told thirty years ago that gas gave a very much higher potential duty than steam; and with the inexperience of youth, he thought in a short time to see ships cross the Atlantic by gas. This, however, had not yet come to pass. He therefore thought that, for the present, people might put down steam-engines with a good conscience, especially when they got good plant. Mr. Lupton also replied. Referring to Mr. Crowther's remarks, he said he was quite sure that a gas-engine could be worked with a smaller consumption than that given in the paper. Electricity had been referred to, and its cost, at 1d. per unit, meant £27 per horse power. If the efficiency of motor and pumps was taken at 75 per cent., the £27 would be converted, roughly, into £36. Assuming labour, stores, and oil cost £10, a total of £46 was reached; and this was the way in which the authors had arrived at the figure in the paper.

In the analysis of coals, oils, bitumens, and similar substances, readers may be reminded, the determination of the sulphur therein plays an important part; and a number of satisfactory methods are in use for the purpose. "The Chemical Trade Journal," however, directs attention to one more, which has lately been described in the "Zeitschrift für angewandte Chemie." It depends upon the combustion of the material in oxygen; but the burning takes place in a large glass bottle at about atmospheric pressure, and not in a metallic bomb. The apparatus and the method of carrying out the test are fully described.

THE GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

ANNUAL MEETING IN HANOVER — JUNE 21 to 25.

THE rooms and the gardens of the Neuen Hause in Hanover last Tuesday evening were the scene of much animation; for there—to the music of the band of the 73rd Infantry, before well-laden board in the rooms or under the trees whose leaves (unfortunately wet from the recent heavy shower) glistened from the rays of the electric lights—was inaugurated the 44th annual meeting of the German Association of Gas and Water Engineers. They have a far different way of doing these things in Germany from what we have in this country. The annual meetings are looked upon as a great *réunion* of friends; and great *réunions* are times in their judgment for great pleasure. While business is not neglected from 9 o'clock in the morning until between 1 and 2 in the afternoon, the remaining time is spent in pleasure officially provided, but towards which the members each contribute by paying a fixed sum for a book of tickets available for all functions. But this Tuesday evening was at once a reception and a *réunion;* and the people of Hanover, represented by the governing body, were those who welcomed and were the hosts. Admirably they did their part; but the weather was-a little unkind, and what should have been a perfect outdoor treat was turned into an indoor supper, with two short speeches, and an after promenade—the while the music was playing. It was a gladsome sight. Everything was simply but yet heartily done. The usual British conventional stiffness on such an occasion was nowhere to be found, unless there was a trace of it among the two or three from home to whom the apparent confusion caused by some 800 people (including ladies) intermingling and greeting each other on all hands, was strange and yet delightful. In the chief hall, there were the Council of, and men of high authority in, the city. There, too, in the midst of the great throng were found the President of the Association (Herr L. Körting, the Engineer of the Hanover Gas-Works). His wife was unfortunately unable to be present owing to indisposition; but Fraulein Körting was at her father's side, There, too, was one of the Vice-Presidents of the Association (Herr G. Grohmann, of Dusseldorf). A sad bereavement prevented the attendance of Mr. W. Drory, of Frankfort. Another great disappointment was that Dr. Bunte was also unable to be present—due, it is believed, to illness in his family. But wandering down the rooms, there were many faces known on this side. There were Mr. R. W. Wilson, the Secretary of the Imperial Continental Gas Association, and several of the Engineers of the important works which the Association possess. However, from personal matters to the general and chief purpose of the evening. It was, as said, a reception by the town; and to the City Engineer (Dr. Wolff) was entrusted the pleasant duty of expressing in words the great sincerity of the welcome of the Council, of which those present had had such tangible evidence. To Herr Grohmann fell the honour of responding. It was much after ten before the last of those who had been assembled in the Neuen Hause and its pleasure grounds had passed their hospitable gates again.

The Business Meetings.

The "Tivoli" was the scene of the meetings; and next morning by 9 o'clock, the members had assembled in large numbers in the spacious theatre attached to this pleasure resort. Notwithstanding the beflagged walls and the stage with its proscenium, the place wore a business-like aspect with its long tables (useful to the members for note-taking), ranged lengthwise through the theatre, covered with papers, and well lined with members on both sides. Only a few minutes had passed after the clock had proclaimed the hour appointed for business when the President (Herr L. Körting) ascended to his place on the platform, with representatives of the city and of the Council of the Association. A smart ring of the bell brought silence. It was observed that despite the seventy years of life and fifty years of work as a gas engineer resting upon his shoulders, Herr Körting looked well and strong, and soon showed that the old energy was still a precious possession. In his opening sentences, he said it was not necessary for him to assure the members that it was a matter of great satisfaction to him to be able to greet, as President of the Association, so many members and guests, and besides it was to him a great personal pleasure. With the end of this year, he would have been just half a century the Gas Engineer in his native town of Hanover, and he had had a great wish just in this year to see his professional colleagues meet together there. They had been kind enough to accord him his wish, and had made his Jubilee Year a double honour, in that they had elected him as their President. He then introduced to the members one of the representatives of the Province, a representative of the Burgomaster, and other local gentlemen; and these all in turn, with great heartiness, welcomed the members. At the conclusion of the speeches, the members rose *en masse* in token of their thanks.

President's Address.

Proceeding, the President said: Gentlemen, you have come here, with fresh recollections of one of the most successful meetings we have ever held yet. That is the Zurich meeting. The wonders of Nature in Switzerland cannot be matched in the North German plain; but the green gardens and the woods of the old town on the Leine have, I think, a certain beauty. Zurich has shown you a gas and water works of an advanced Municipality. The gas-works especially were pronounced by my colleagues as a model of modern technique. We have nothing to show you of such magnificence. But I flatter myself that we in Hanover can show you a plant and results which may be regarded as the completion of the impressions made at Zurich.

Our Society has already met once in Hanover. In 1882, the twenty-second meeting was held here. To-day the forty-fourth meeting is being held; so that the Association has just doubled its age. And, gentlemen, what great advancements have these 22 years shown in the City of Hanover, in the profession which we represent, in the Association itself, and what great alterations in the ranks of the persons taking part in its work. The Society had at that time a membership of 381; to-day, we have 954 members. Of the 200 members present twenty-two years ago, there are still 60 here; and I should like to know how many of the associates of the first Hanoverian meeting are also here. I beg of those old members to be so good as to stand up. I count 12. Really, a small number. It shows very clearly how many have, during these 22 years, gone before us to the great majority. Where they are, we shall want no artificial light, and will refuse the purest of water. And among those the best and most loved Schiele and Schilling, Oechelhäuser, Kuno, Lothar, Diehl, Kinnel, Merz, and Joly should be referred to. How thankful we old ones must be that we have been able to work with vigour so long. The whole Council is in this fortunate position. To me it is a most happy coincidence that I was elected exactly twenty years ago for the first time to the Council; and now, on the same spot, I conclude my labours as President. On this very spot a not-to-be-forgotten Schiele occupied this position for the last time, the functions of which he had discharged with so much ability for twenty years.

Then here, again, in Hanover the reorganization of the Association was decided upon, in which the difference between members and associates was made; and thanks to the good countenance and aid of those who were to become associates, this was peacefully concluded. In this reorganization, too, it was agreed that a yearly change should be made in the presidency, so that new blood and new ideas should spring forth. The first to take his place in the van was the young Munich professor—Dr. Hans Bunte, who now, with the highest scientific honours upon him, is the General Secretary of this Society, and is a standing member of the Council. This progress is Grahn's work.* He saw at once Bunte's great gifts; and, by his influence, he got the Council to adopt the suggestion that Bunte should be appointed as Manager of the scientific aims of the Society. Since then the Association have passed into the sign of Bunte; and there is scarcely another professional Society in the world who have so much for which to thank their General Secretary.

The last 22 years have been, for our profession, a rich and satisfactory period; and the gas-works of Hanover have, among others, profited thereby. So far as circumstances have allowed, nothing unnecessary has ever been added or done at the Hanover Gas-Works. The works can be named as typical of those which, from small beginnings, have gradually expanded until they are one of the largest gas-works in Germany. The principle of combining the highest results with the lowest or smallest outlay has been executed here with good fortune and ability on the part of those who have had the responsibility. I should like to call your attention to another point. The ground on which the gas-works were begun 78 years ago lay at that time far from the doors of the city, and in the centre of pretty orchards. I know the changes very well, because on the green banks of the river we caught fish, and on the water we sailed our boat, called the "Lead Duck," because the gas-works carpenter who had made it had chosen wood which was very heavy. To-day the site of the gas-works is in the centre of our lighting district. Hanover and Linden have extended round about it to a great extent; but our Directors, with great prevision, have always secured so much land at a cheap price that the works will suffice for the whole of the 100 years over which the Association are entitled to work here. A happy purchase secured the connection of the railway with the works; and the river is patiently waiting for the connection with the projected canal from the Rhine to the Weser and Elbe. Although built in on all sides by town buildings, the works cause no nuisance; for the lines of construction have been so laid down that everything causing noise or smoke or smell is placed in the middle, whereas the quieter parts of the works—such as the coal-stores, living-houses, and gardens—are placed on the outside of the area. In addition, care has been taken to economize space. I scarcely believe a second gas-works exist which make so much gas on so small an area. Nothing has been altered unnecessarily, nor has anything been taken down which in any manner could be made use of. In this way, the first gasholder tanks are employed as tar cisterns for storage. The old office, too, exists at the present time, in which the first

* Herr Grahn was formerly Gas Engineer at Essen, and is now a Consulting Engineer practising in Hanover.—ED. J. G. L.

Gas Manager's wife—the mother of so many excellent and most talented professional men (Mrs. Leonard Drory) sold the first coke and paid out the coal dealers. In that same office, my mother later on assisted her husband in the same duties. The retort-houses are still standing in the same (it is true, much lengthened) line. The original six beds of four iron retorts have, of course, disappeared long ago; and beds with six and seven retorts have arisen on the ground on which they stood. But these, too, are only now kept in reserve, so as to help through the winter, when the modern generator settings are insufficient.

I would draw your notice especially to this generator-furnace house of 40 beds of nine retorts. It is for hand labour only—perhaps the most rational form of stoking which exists. The beds stand back to back; but the retorts can be, if one wills, worked as throughs. The ventilation of this house is perfect; the roof over the settings being entirely wanting. The coal is contained in pockets on the wall of the house, into which pockets it can be carried direct from the coal-trucks. On the other side, waggons with flap bottoms, and of a capacity of 1750 kilos, are taken from the store, and raised by a hydraulic lift above the pockets. These pockets are open at the sides, so that the coal can fall out by gravitation on to a table before which the scoop is laid. The scoop is readily filled by a scraper; and the filled scoops are moved out on a revolving cantilever, lifted by three men, and carried to the retorts. The coke falls through the stage-floor into a coke-vault below. There it can be either loaded direct into the dealers' waggons or conveyed by hand in iron skips to the breakers. We have never been able to calculate upon any saving by the adoption of other means of coke transport. Again, so long as the wages of the stokers did not exceed 4 marks (4s.), we had no grounds to depart from our simple way of working. Then the results which we obtained by this method were brilliant; but the wishes of the workers on the one side to earn more money, and on the other to have some lightening of their labour, compelled us to take into earnest consideration the adoption of machine work; and we are now engaged in trying to find out the best of the new charging and drawing machines. We can show you the Paris charger and drawing machine for 6 metre long retorts (which have been erected by the Berlin Anhalt Machinen Actien Gesellschaft), and Eitle's machines—the "Cobold" charger and "Schlange" [snake] drawing-machine—for the 3 metre long retorts. As the extension of this house would mean a considerable enlargement, no opportunity has been found of late years to put up furnaces with inclined retorts, which should scarcely be found wanting nowadays. Last winter we were obliged to use 16 of the old grate furnaces; and we have soon to decide the way in which we must carry out further extensions—whether by horizontal retorts with machinery, inclined, or vertical retorts. To put up long retorts vertically, and to merely fill them, would be the ideal of simplicity. I had hoped that Dr. Bueb would have been able to-day to declare to you that this problem has been solved. But all good things take time. The trials which the Dessau Company, together with the Imperial Continental Gas Association, are carrying out have not yet been completed; but I trust that the time is not far distant when the results will be so satisfactory that one can venture to build an installation on those lines.

Gentlemen, you will see on my works a machinery-house, which cannot beat in elegance new erections, but which on a space of 19 by 24 metres combines everything for the exhausting, cooling, and washing of 120,000 cubic metres of gas daily, and which is capable of containing apparatus for dealing with gas up to 200,000 cubic metres. There you will find next to the 30-year old atmospheric condensers and scrubbers (which, in spite of their age, eliminate the ammonia down to 0·3 gramme in 100 cubic metres), a Drory washer, and the Bueb cyanogen and naphthalene washer. The old steam-jet exhausters, too, are standing unobtrusively against the wall; but as regards simplicity, cheapness, and cost of working, they may yet seek their rivals. All this, translated into business language, means that the Imperial Continental Gas Association have been able to carry through one of the most important laws for every industrial establishment—that is, the golden rule that capital should be kept as low as possible. Of course, I cannot give you figures. The business man never does that. But I can assure you that if we were to reckon up all the capital expended in Hanover since 1826, we should obtain a figure of which the Association would be proud.

It is further easily to be understood that a private concern which must earn money (for that is its duty) must reckon strictly on good technical results; and the Imperial Continental Gas Association are well qualified to do this, because they have nearly 80 years' experience of so many large towns, and have an educated and numerous staff of engineers, who all do their duty with pleasure, because their Directors, without any triviality or smallness of mind, place great and honourable confidence in them. The result is that every employee is devoted to the Association; and so much so that very often the father is found introducing his son into the business of the Association. So you will find among the Engineers the names of Drory and Körting unto the third generation. The Association have always shown the greatest liberality to, and thought for, their workmen, in granting them sick funds and pensions for themselves and their wives.

In another way, the Association must contribute extensively to the public good. The Association must contribute very largely to the cost of the public funds, as they have to pay for the right of existence here until 1925 by the payment of 3 pf. per cubic metre of gas sold, and supply the gas for the public lighting at half its cost price, and with the free handing-over of the whole works at the end of the period named. These are enormous burdens, which must tend to hinder the extension of the use of gas by means of reductions in price. England has to thank its enormous gas consumption to the sliding-scale—that is a provision by which, as the dividend is increased, the price of gas must be reduced to a certain extent. Of any increase in profits, the companies obtain one-fifth and the public four-fifths. This is the reason for the low price of gas, and the high consumption in England. Here in Hanover, where the great economy and a high consumption alone can give the Association a reasonable profit, we must exert ourselves to the utmost to popularize the use of gas. For this purpose, a special organization has been called into life—the so-called "Gaskontor," in the middle of the town. This is a show-room and installation business on a very large scale. The newest and best of heating, cooking, and illuminating apparatus is to be found there; and a working army of 170 men completes all orders expeditiously. The extraordinary increase in the one direction of lighting, and the extension which has taken place in the use of gas for cooking and heating during one generation, are marked especially in the alteration in the organization of the Gaskontor since 1882.

Twenty-two years ago, I collected for the meeting the best known gas-burners and explained the same; and, in reading over my address of that date, I find that I praised Siemens's regenerative burner. Siemens's regenerative burner! What was that? Then I think of another burner—the Wenham lamp. These are names not forgotten by me. Then we had thousands of them in stock; and I hope we have kept one or two in memory. Their light, however, has paled before the glory of the Auer mantle. In 1886, at our meeting at Eisenach, Pintsch showed, for the first time, a mantle. This mantle caused great enthusiasm; and I was foolish enough to order 600 burners at 15 marks each. But, happily, they could not be supplied. Then they proved to be really worth nothing. But by 1890, the last difficulties had been overcome; and the triumphant entry of the mantle began, to the great benefit of the gas industry, which would otherwise most probably have been pushed aside by electricity in the lighting field. Very soon, one found that the mantle glowed more brilliantly the quicker the gas stream made its exit from the burner head, and took its combustion air with it; and so a large number of systems sprang into being to obtain a higher gas pressure and a larger lighting source. The Kugellicht, the Millennium, Lucas, Keith, and the Pharos lights are well-known examples. The last-named light uses a rotary pump, and requires no pressure governor, which the plunger pump always needs. The Selas light is a mixture of gas and air conducted to the burning point; and the object of the best possible combustion is very well obtained. In fact, there is no end to the different inventions. On the gas-works here you will find an installation of the Pharos light in action. This whole system of vastly improved lighting, we must never forget rests on the discovery of Bunsen—the giving of the gas, before it is ignited, the proper admixture of air. The Bunsen burner is the foundation of the Auer light. And, in the same way, it is the foundation of other important uses of gas, which began twenty years ago to alter the aspect of our kitchens. The Danes were especially much in advance of us in regard to the use of gas for cooking; and our Association have taken great pains to trumpet the advantages into the ears of the German housewife. Richard Goehde's [the Association's late Engineer in Berlin] war-cry was "Koche mit Gas." I should like to add to this cry the following: "Koche mit Gas; Heize mit Koks; Beleuchte mit Gasgluhlicht." Hanover was one of the very first towns which introduced gas-cookers. This place was really the first field of Goehde's labours; and from here our lecturer Fräulein Hothmann was sent, and has held so many successful lectures. I must especially mention here that small book "Kein Haus ohne Gas" which was sent out from Dessau, and which has undoubtedly had very much influence.* In 1888, when the first special gas-meter for cooking gas was placed here, and the gas price was reduced to 12 pf., the consumption for cooking was only 150,000 cubic metres a year; yet now over 40,000 families annually use over 12 million cubic metres of gas for cooking—all separately measured.

One thing remains; and that is the great extension of gas-engines in the last 22 years. But the best period of the existence of lighting-gas engines for the smaller industries has, I am afraid, already passed. In towns where electric current is sold so cheaply, it is cheaper and more convenient for small industries to use electro-motors; for the large industries, to use generator and suction-producer gas; and for the largest factories of 1000 or more horse power engines, to use blast-furnace gas. But all these monsters have proceeded from the lighting-gas motor, and belong to the progress of the gas industry. Here in Hanover the consumption of lighting gas for engine purposes has remained for many years at 1,500,000 cubic metres.

You, gentlemen, have all taken part in this progress. You have all passed through experiences resembling those which I have passed through, and each of you has gained by those experiences—from the perfection of the furnace, transport arrangements, and apparatus and appliances for producing and using gas. You

* A notice of this pamphlet appeared in the "JOURNAL" for Nov. 10 last year, p. 352.

all know how colossal the activity in the whole field of our industry has been, and is still. And I refer again to the beginning of my address when I specially mentioned that Dr. Bunte has illuminated this progress through the light of Science in the "Journal für Gasbeleuchtung" and mostly through himself. We know—and the whole foreign technical gas profession knows with us—in what honour the name of Bunte is held. Gentlemen, we are not in any way at the end of the progress of the gas industry, for many important questions have yet to be solved. It is for us old people—and it is a coincidence that none of us here at the Council table are young—a great joy to have been able to live during this period; and we are jealous of the young ones who are still in the middle of life and are looking forward to all the fine things the future has in its lap. They can do their part to help to the solution of these questions, and they will still find new tasks ever arising. Of these, never-ceasing competition will take care. On the other side, scientific knowledge is always dipping deeper and deeper into the secrets of Nature. One of the most interesting discoveries of later times has lifted the veil a little, and that is radium. Professor Runge, of the Technical High School of Hanover, will be lecturing to us on this rare and most interesting substance.

From the foregoing (which is almost a literal translation of the address), it will be seen that a fairly representative inaugural deliverance of a President of the German Association does not partake of anything like the ostentatious character in respect of length and diversity of matter that a presidential address at home does. The President delivered it in a clear voice reaching to the farthest portion of the hall; and his expression was excellent—emphasizing well, by modulation of voice and gesticulation, the points he wished to make. There was something almost dramatic when he called upon the old associates who were present 22 years ago at the Hanover meeting to rise in their places, and only twelve responded. Of course, there are more; but it shows distinctly, in view of the largeness of the meeting, how time thins the ranks. The quiet humour, too, in parts of the address was relieved by the President's manner of delivery; and there was quite "a merry twinkle" in his eye as he referred to the great projected canal for which the Hanover Gas-Works among other large institutions are now so patiently waiting. The reference evoked considerable laughter, which induces one to infer that in Germany the scheme is regarded as being somewhat quixotic. However, the thanks which Vice-President Grohmann tendered to the President in the name of the members received very hearty approbation.

Radium.

The President having responded, called upon Professor Runge, of the Technical High School of Hanover, to lecture on the subject of "The Properties of Radium." This he did—giving, in a darkened room, some admirable demonstrations and lantern views to elucidate his many points. Just a few words to indicate the interest contained in the lecture. In the first place, Professor Runge showed the action of radium on the electric spark of an induction coil. In the presence of radium, the spark ceases, and a silent discharge takes place. The lecturer illustrated the action of radium on different crystals and upon photographic plates. In all these respects, the action of radium is similar to that of an X-ray tube. A closer examination, however, shows that the rays from radium are not Röntgen rays—or at least not only Röntgen rays. One part of the rays carries positive charges; another part carries negative charges. The first move less quickly, and are more easily absorbed. The idea is that the radium atom falls to pieces, and that, in this process, small corpuscles are hurled off. The forces giving them their velocities are to be found in the attracting and dispelling forces of the electrical charges. These forces are also the origin of the astonishing amount of energy given off by radium in the form of warmth. Another bye-product of the process is a certain gas which, as Ramsay and Soddy have shown, finally produces helium. These results are so new and revolutionary that it will be some years before they will be generally accepted. One must say, however, that the observations have been made with all care; and that the production of helium has been repeated by both Curie and Deslandres.

There was great applause at the end of the learned lecturer's exposition of this (for present-day scientists) enrapturing subject. Perhaps no less equally erudite, but of insufficient connection with "JOURNAL" topics to claim admission here, was the paper by Professor Hoyer, likewise of Hanover. It dealt almost exclusively with the geology of the formation in which petroleum is found in Germany, and was illustrated by some very clear views of the plant connected with the oil-wells of Wietze. He, too, received the courtly expressed thanks of the President, as did also Herr Prücker, the Engineer of the city electricity works of Hanover, who described the works with great completeness.

Testing Gas Coals.

The contribution which followed must be noted at greater length. Its author was Professor Drehschmidt, whose work has frequently been noticed in the "JOURNAL;" and his welcome, on ascending the platform to present his paper, was of the most hearty description. In the first place, the author stated that the determination of the qualities of coal according to their chemical composition has not been reliable, because coal is a mixture of elements themselves of several compositions of which the qualities are unknown. To arrive at a really proper judgment in respect of these qualities, the only thing that can be done is to have a thorough distillation of the coal; and for this object an experimental gas-works solely for the purpose is necessary. It is very difficult to make examinations of coal in gas-works themselves; and, in fact, there would be a great loss in making examinations of the coals in practice. It is impossible, too, to carry on the work in the laboratory with small apparatus; and the tests must be made under the same conditions as those under which the work of carbonization ordinarily proceeds. Further, while the tests should be on something more than the laboratory scale, they should not be too large, so that they can be superintended in an easy manner, and be independent of the irregularities of ordinary gas-works. The best method of procedure is to erect a bed of one or two retorts of normal size, quite independent of the works, but with all the other apparatus—purifiers, scrubbers, and the rest of the plant complete—so as to conform with an ordinary works, but in the same proportion as the experimental bed. In this way, it is easier to superintend the work; and the alterations required by the coal under examination can be readily made—such as in the temperature of the bed, the size of the charge, and the duration of the distillation. These various conditions must be altered until the best results possible can be obtained from the coal under examination—in other words, what Professor Drehschmidt was insisting upon is that (just as the London Gas Companies contend in regard to their gas) each type of coal should be subjected to that treatment which will return the highest yield of gas. Now at the Municipal gas-works of Berlin, a great number of tests have been made on these lines; and, by such means of experimenting, they have succeeded in increasing the product of a certain coal (taken merely for example) from 305 cubic metres per ton to 320 cubic metres. Examinations have been made of a great many different kinds of coal there—to the number of 68, English, Silesian, and Westphalian; and it has been found that the results of distillation carried out in the manner best suited to the coal have a very loose connection with the chemical composition. It is not, Professor Drehschmidt contends, possible to make quite sure of any determination from the chemical composition of coal as to what is the maximum yield possible of gas and bye-products of any class. This assertion, he says, is proved by a great many tests, and the collection of much statistical information; so that the Professor recommends every works (large enough) to have an experimental station, in order to ascertain for themselves the best working procedure to get the most profitable yield from the coal, and so the greatest return from their works.

For the first time at this sitting, there was a little discussion, which was commenced by Dr. Leybold, of Hamburg, who stated that he had worked a great many years with different kinds of experimental plants—first, in Munich with the old Schilling plant—that for many years he carried out the well-known coal tests of Schiele, and that he had arranged an experimental plant in the gas-works at Hamburg. It is, he holds, especially necessary for the gas-works in the North of Germany to have good experimental plants, because there the English, Scotch, and American coals come in competition with Westphalian coal. Gas-works must therefore be in the position to make quick tests to gain an idea as to the value of the coals in reference to price, and it is also necessary to try a sample of coal from every steamer. The plant at Hamburg consists of one retort in an ordinary bench of the works; and the crude gas passes to a small hydraulic main, to the condenser, scrubber, purifier, through a 200-light meter; and then on to a holder of 60 cubic metres capacity. The charges used weigh 150 kg., which gives (say) 45 to 50 cubic metres of gas, or, with cannel, 55 to 58 cubic metres. The gas is tested after some hours for illuminating power, specific gravity, sulphur compounds, and sometimes also for calorific power. The coke is also weighed, and the ash is determined. The results of the experimental plant are nearly the same then as those that are secured in ordinary working. There was a brief response by the author; and then the President, in thanking him in the name of the Association, referred to the trial gas-works that the Association are proposing to build at Carlsruhe. For this purpose, 70,000 marks are required; and, by voluntary contributions, it is hoped to get this sum. It is proposed that these experimental works shall be run while trials are going on at different gas-works in the country; so that the results will be valuable for reference and comparison. The coal will be supplied to the Carlsruhe experimental gas-works; and the works will benefit from the residual products. [Further reference to these experimental works is made in the account of the last day's proceedings.]

The Water Supply of Hanover.

This concluded the sitting on Wednesday; and on Thursday the greater part of the proceedings were connected with water supply. The attendance of members, however, was equally as large as on the day preceding.

The first of the papers was on "The Water Supply of Hanover," and was by Herr A. Bock, the Water Engineer. It appears that the supply of water for domestic purposes is obtained from the drainage of sands and gravels in the valley of the Leine. The cast-iron pipes used for this purpose are of 80 cm. (32 inches) diameter, with 10 mm. apertures. The upper side of the pipe is 3 metres (10 feet) under the ground water-level; and the

bottom of the pipe is 1·3 metres above the impervious layer of clay marl forming the basin. The present works were erected in 1879, and were extended in 1899 by groups of wells. In the last-named year, too, further drainage pipes were added to the wells. Then in 1894, a preliminary set of pumps was put down; but the water got turbid. There was a large yield, but it was found to come from the river through the ground; and then the supply was diminished by the clogging up of the filtering surfaces. The daily yield was 5,280,000 gallons; but in very dry periods only 3,100,000 gallons. The water is very hard, and contains gypsum (sulphate of lime). The hardness is from 29° to 39°. Occasionally iron and manganese in small quantities are found. There has to be a constant flushing of the mains; and as many as 600 connections have been found blocked up, and meters have had to be renewed. In 1899, a new drainage area was brought into use, and considerably supplemented the supply. At the end of March last year, the number of customers was 10,601.

The Hygienic Aspect of Water Supply.

Dr. Gaertner, of Jena, discoursed on this subject, with but few references to notes, for something like an hour and a half; passing in review the various questions appertaining to water supply from the hygienic point of view. A general and absolute requisite for a water supply is that it shall not be noxious. All other considerations are subordinate, though sometimes practically very important. As, for example, the maintenance of a constant temperature of the water affords a cool and pleasant drink in summer; and so, the Professor thinks, may constitute one of the best means of assisting to suppress the excessive use of alcoholic drinks. In his opinion, the water engineer should lay his pipes sufficiently deep—protecting them and the reservoirs against changes of temperature. The water must also be clear. Turbidity always means insufficient filtration and possible danger. The first turbid waters are especially to be avoided. Waters may contain iron and manganese salts, which, in decomposing, yield a precipitate of oxide. For all practical purposes, it is important that the suspended oxides should be removed; and special attention should be paid to the manganese. As to purity, the Professor discards standard figures; and he dwelt upon the solvent action of soft waters upon minerals, metals, and cement—going somewhat in detail into the chemical reactions. Coating of pipes he regards as of the utmost importance. A good test is to fill a pipe with weak hydrochloric acid, when all the small pores are at once detected by the bubbles of hydrogen that are evolved. Common salt, he points out, is of frequent occurrence in underground waters; and, being perfectly harmless, the limit is practically governed by the taste—0·2 gramme of chlorine may be about the limit. An ample supply of water is absolutely essential to hygiene; and he urges that all extensions of works should be provided for in due time, so as not to compel the engineer either to restrict the use or to have temporary recourse to a doubtful source. The former requirement of some bacteriologists of a completely sterile water is, in the Doctor's opinion, an exaggeration—it is not the number, but the nature, of the microbes that is of significance. The detection of specific germs, besides being very difficult of identification, is too largely a matter of chance. Underground waters are sterile, and may be kept so by adequate protection of the zone influenced by the drainage. In contradiction to prevalent ideas, springs are a good deal behind underground water in regard to bacterial purity, especially in fissured rocks. The frequency of typhoid at Paris is largely due to this cause; and, practically, the only disease to be considered is typhoid. By, however, combining the purity of the water supply with all the means of limiting the cases by isolation, disinfection, &c., a good deal can be done. Again, Paris may be quoted: an excellent system of supervision of the whole district around has proved very efficient since 1900. [In connection with this statement, it should be remembered that there were several serious outbreaks of typhoid after the year mentioned—notably, in the beginning of this year, and that only in the second week of June, a notice was issued to the effect that, owing to the heavy rains, all the springs had become turbid, and that the water should be boiled.] Koch has applied this system in connection with the malaria in South Africa, and is now rendering signal service by doing the same for typhoid in the Rhenish provinces, where, in case of war, large armies would gather. The lecture (for so it should be termed) was listened to with the greatest interest.

Succeeding this was a paper by Herr E. Froitzheim, of Cologne, on "The Proposed New Law for Steam-Boilers." But this has little interest outside Germany.

On the Use of Gas Coke.

Herr Stack, of Hanover, next claimed attention with a long communication on "The Use of Gas Coke." It was pointed out by the author that, in view of the efforts made by local authorities to diminish smoke in towns, gas coke is an important factor not to be disregarded, because of its smokeless combustion. An interesting diagram, showing in different shades the intensity of smoke emitted by different fuels, was exhibited by Herr Stack; and he also showed tables giving the quantities of hard coal, soft coal, and coke used in Hanover. Inquiries of the large towns in the country brought to him the information that the consumption of coke for all purposes varies considerably. Comparatively little is used for boilers; some engineers even going to the length of saying that its use is not possible. It is, however, encouraging to find that its employment is greatly extending—town authorities making use of it for heating schools, municipal buildings, baths, &c., and in some cases for the boilers of the electricity works. The use of coke for private purposes is, of course, controlled by the price of coal. Answers to the inquiries showed conclusively that it can be used in all kinds of boilers. It appears to be harder than coal to handle; and in some cases blowers are employed. Fluctuations in the demand on boilers cannot, it is found, be met so easily as with coal, in view of the fact that coke is more difficult to fire up quickly. A table furnishing the results obtained by heating boilers with coke, with and without blowers, showed that, if the boilers are large enough, nothing is to be gained by using a blower. From the answers received from Hamburg, it is learnt that all boilers under the municipal control are arranged to burn coke, so as to avoid smoke. In some towns large quantities are used in bakers' ovens; its cleanliness being much in its favour. A good furnace for ovens is that known as the König; and in Breslau, 23 bakeries are fitted with it. As a matter of fact, in that town concessions for new bakeries are only granted on the condition that smokeless fuel is used. Another fact brought to light is that the use of coke for smithy fires is very limited; its cost being some one-fifth to one-eighth dearer than coal. In good furnaces, coke can be, and is, used in brewing. Turning to the domestic use of coke, it has not received a great adoption in the country, on account of the fact that, in the ordinary German stove, it cannot be burned unless mixed with coal. But the general extension of central heating arrangements (hot water, hot air, &c.), with stoves specially constructed for coke, must have, and has, a great influence on its use. The author also pointed out that the quality of coke is very variable; the ash amounting in some cases to 18·3 per cent. He concluded by urging the members to improve the quality of the coke as much as possible. Of course, Herr Stack is not a gas engineer, or he would have known that the quality of gas coke is a matter over which the engineer has little power; and that the chief function of a gas engineer is to get as much as possible of his prime product out of coal (conformably with the quality of the gas he has to supply or his method of subsequently treating the gas), while the quality of the coke is rather of secondary importance. It was pointed out by the President, in thanking Herr Stack, that little can be done to improve the quality of coke, as the ash is in the coal, and cannot be removed without costly washing arrangements. But much can be accomplished in the way of carefully sifting coke and breaking it to suitable size, and, above all, in improving stoves for ordinary house heating.

Lighting of School Rooms by Gas and Electricity.

The first contribution on Friday morning was by Dr. E. Schilling, of Munich. It recorded the results of experimental comparisons made at Munich of diffused arc lighting and gas lighting in the lighting of auditoriums and school rooms. The experiments were inaugurated by the Association, and were made by men of science at the Technical School and University at Munich. This communication was really a preliminary report; and it demonstrated that gas lighting was not behind electric lighting in any direction, and that high-pressure gas lighting of high illuminating power is especially suitable for large rooms.

Reports of Commissions.

The attention of the members was next claimed for the reports of the various Commissions who had been charged with inquiries during the year.

Photometrical Commission.—Dr. Kruss, of Hamburg, presented the report on this subject. He stated that as yet no resolution has been come to by the Commission, seeing that they are still making tests with the 10-candle pentane lamp, and the French Carcel lamp, which they are comparing with the German Hefner lamp. They hope, however, in the course of this year that the whole of the experiments will be finished; and if any gas engineer has any observations or information to make to the Commission, he asked that the communications may be made by Oct. 1.

Meter Commission.—Herr Söhren, of Bonn, next presented the report of this Commission, from which it appears that it has for some time past been observed that in dry meters the leather gets injured very quickly; and the cause has not yet been discovered. It has recently been decided to induce the meter makers to employ a chemist to analyze the leathers, so as to find out what is the reason of the destruction; and the Commission also ask gas engineers who have not been troubled with this form of destruction in dry meters to take some off and experiment with them, and see if they cannot also contribute to the finding of some solution. There appears to be much difficulty in coming to any conclusion on this subject; and in order to prosecute further research, Herr Söhren asks for funds for the purpose.

Water Commission and Electrolysis Reports.—Herr Grohmann reported the death of two out of three of the original members of this Commission; and Mr. M. H. Lindley, of Frankfort, made a long statement on the work of the Commission, from which it appears that they have not been able to move very much. He also reported on the subject of electrolysis. A circular letter has been sent out making inquiries. Some 112 answers have been received where nothing was noted of electrolytic action on gas or water pipes; and in the case of only 10 per cent. of all the letters sent round was the report made that small difficulties had been found, but there was nothing decisive or very serious. He hopes

to present another report next year or in some subsequent year. Before anything very definite can be done, as considerable difference is found in various towns, there may have to be several years' experience and investigation. It has, however, been proved, he says, that connections with gas and water pipes for the return currents to the central stations, do occasion damage, on account of the free current of electricity being stopped by the bad conducting material in the sockets. Such connections with the gas and water pipes make the trouble from electrolysis much worse perhaps than it otherwise would be; and this will also, he hopes, be further reported upon in the course of a year or two. There was a discussion on this subject, several members taking part. It was gathered that the Committee on Electrolysis had spent more money than they were authorized to do. They only had sanction to spend 700 marks; and they had expended 6000 marks. They asked for another 6000; and they obtained it by the vote of the meeting. One member spoke strongly against it. He considered that the proposed experimental station was of far more consequence than the granting of money for such a vague thing as electrolysis; but the members generally did not agree with him, as shown by their decision to make the additional grant.

A Question of Water Purity.—A member of the Commission on the management of water-works also reported that their work was not finished. Their trouble seems to be to give a definition to the term "pure water." The Committee have discussed the matter, but have come to no conclusion as to a standard definition. They hope they will reach one by the end of the year; and in the meantime certain Government Departments will state their opinions.

Educating Foremen and Fitters.—The next statement made had reference to the school for gas-works foremen and fitters at Bremen. This has worked with satisfactory results; and, as customary, the necessary money was asked for to carry on the work. A second school has been established at Cologne, and is also giving gratifying results. The Committee obtained the money required. It was also agreed that the various Societies connected with the Association—for instance, that in the Rhenish Province, in the Baltic, and in Berlin—should send a representative to the meetings of the School Commission, but that each Society should pay the expenses incurred by this representation.

Unread Papers.

Two of the papers in the original programme—that by Dr. Bunte on "The Proposed Experimental Gas-Works," and by Herr E. Grahn, of Hanover, on "The Gelsenkirchen Water Supply"—did not appear on the final *agenda*. Two that did—one on "The Evolution of the Insurance Union of Gas and Water Works since 1885," by Herr Heidenreich, of Berlin, and the other on "The Wanner Pyrometer" by Herr Wanner, of Hanover—were not read. This pyrometer, it is learnt, is constructed for measuring temperatures of over 900° C. The apparatus is really a small portable photometer; and the temperature is calculated by the light rays sent out by the body or surface examined—the standard used being a 6-volt incandescent electric lamp.

Annual Report of the Council—The Experimental Works Project.

General business followed; and one important item was the annual report of the Council. It opened by stating that the Association have this year attained the legal status of an individual, and have issued a new set of rules and regulations. This legal status is of much importance, in view of the not inconsiderable property now possessed by the Association. Another matter mentioned is that, for the first time, the proceedings of the Association have been published in a separate form; and they are issued complete and gratis to the members by the publishing firm of Oldenbourg. This will entail a heavy call upon the funds of the Association; but it is hoped that this will be compensated for by the convenience which the publication will be to the members. The great losses suffered by the Association during the past year are also mentioned—reference being specially made to the loss of Herr E. Merz, of Cassel, and Herr F. Joly, of Cologne, whose activity will cause them to be greatly missed, and their memory will be long preserved. Among the older members who have been called away are Herr Carl Blume, of Potsdam, and Herr Gustav Fahndrich, of Vienna. The happy events of the year to which attention is directed included the jubilee of Herr Thomas (of Zittau), Mr. W. Drory, and Herr L. Körting. Coming to the technical work and inquiries of the Association, it is stated that it is proposed, in order that proper tests of coal and other material used on gas-works can be made with the utmost reliance, to erect an experimental gas-works. The Council of the Association recommended that the sum of 70,000 marks (£3500) be devoted to this purpose. The Council hope that the members will give this project their hearty support. It is also reported that, at the instigation of the International Committee on Photometry, the Lighting Committee have resolved to propose a revision of the prescriptions respecting the photometry of gas-lights, and to make investigations particularly in regard to the testing of incandescent mantles. Special research is also to be made as to the heating properties of gas in connection with incandescent mantles, &c. The Heating Committee have also busied themselves with the question of the use of coke as regards baking-ovens, which often cause annoyance owing to the smoke emitted. A report on the subject was also made to the members. The Committee appointed to consider the desirability of adopting a universal specification for gasholders have also drawn up a draft specification, and have expressed the hope that this will be accepted by the authorities. The Committee on water statistics have suffered loss by the death of Herr Joly; but Herr Grohmann has consented to take up his work, and it is proposed to strengthen the Committee by the election of new members. A further statement is that a circular has been issued on the subject of stray electric currents. Of 170 circulars sent out, 131, from 117 towns, have so far been

FIG. 1.—GENERAL VIEW IN THE HANOVER WORKS, SHOWING (ON THE RIGHT-HAND SIDE) THE OVERHEAD RAILWAY RUNNING ALONGSIDE THE RETORT-HOUSE.

returned, and an expression of thanks for them is made. There is an indication of great life in the Association in the advance of technical investigation. Figures are also given as to membership. At the end of 1902-3 there were 910 members; and at the end of the past year, there were 954 members—that is to say, one honorary member, 789 ordinary members, and 164 associates.

The report was adopted, after an extensive discussion on the subject of the establishment of experimental gas-works at Carlsruhe. Many of the speakers offered strenuous opposition to the project, on account of the expense. In the result, it was agreed that plans and specifications for the experimental works should be prepared, and submitted at the next annual meeting. This, of course, postpones the erection.

Coblentz was selected as the place for next year's meeting. The members also showed their great confidence in Herr Körting by inviting him to take the presidency for a second year. This he consented to do; and he enters upon his new year of office with all the honours that the assembly in Hanover last week has brought upon him.

During the meeting, there was an excellent display of lighting, cooking, and heating appliances in the entrance hall and annexes of the Tivoli. This occupied the attention of the members before and after the meetings, as well as during the interval allowed for refreshment each day.

SOCIAL EVENTS—A VISIT TO THE HANOVER GAS-WORKS.

New Stoking Machinery.

The opening paragraph of this delineation of the past week's doings in Hanover gave a brief account of the inaugural function, which was carried out with the customary circumstance of Germany. In that paragraph, too, reference was made to the abundant provision that is made on such occasions as these for the delectation of the members and their ladies. Every morning there were visits and drives to and through places of interest and beauty for the ladies, who then joined the gentlemen in their afternoon excursions and their evening amusements. Taken on the whole, the weather, though not brilliantly favourable, was not bad for these events. One of the best of the excursions was on Wednesday afternoon, when there was a drive to Herrenhausen, there being (at a rough guess) some 250 carriages in requisition for this purpose. The procession was a sight even for those taking part in it, and a source of great attraction to the citizens. The programme included a visit to the electricity works of the city which the Engineer had described in his paper in the morning. The smartness of the place and rooms was a matter of much comment and complimentary remark. Refreshments were provided here. The return drive embraced the grand wood of Steuerndieb, in a large café at which supper was served. The following day, the afternoon excursions included a visit either to the Egestorff locomotive works at Linden, or to the magnificent works of Messrs. Körting Bros. at Körtingsdorf. From these places, the visitors proceeded to the city water-works; and in the evening came another of the great and charming fêtes of the week. The hosts were the Imperial Continental Gas Association; and the scene of the affair the gas-works. Erected on one side of the works was an enormous marquee, capable of accommodating quite 1000 persons. The festivity must be left for a space in order to speak first of the more prosaic part of the programme—that was, an inspection of the works. In a special article (which has been limited to the growth and present constitution of the works) will be found all that need be said respecting the general features; and, in a less extensive manner, other references to them will be found in the presidential address.

If the new stoking machinery and the coal-handling plant that their trial has rendered necessary were shifted from view, one can then see the great simplicity that runs through the whole of the scheme of these works, which have stood, under their past conditions of hand labour, among the cheapest worked undertakings in Germany. But invincible labour and its requirements have now necessitated the trial of new stoking plant for the purpose of assisting in the determination of what is the best and cheapest machinery for this work in all respects—initial cost, working expenses, and maintenance. It was to these machines that the visitors gave most attention, or rather the male part of the huge assembly; and, in view of the descriptive matter elsewhere, we will leave the rest of the plant, and devote this account of what was seen almost exclusively to the new machines. In escorting the members round the works, the President was very heartily helped by Mr. W. Anderson (who is the Chief Assistant-Engineer, and has been at the works now rather more than half the time that Herr Körting has held the premier control of the undertaking as Engineer and Manager), and by the Second Assistant, Herr Pohmer. The railway connections with the State railway were inspected, together with the fine coal-store, which is 107½ metres long by 53 metres wide, is divided into ten bays, and will hold 16,000 tons of coal between the ground level and the rails of the elevated lines. The idea of dividing the house into separate sections is to prevent any spontaneous combustion from spreading, this being one of the unkind things peculiarly affecting Westphalian coal. A secondary consideration is that the division gives better control over the contents of the stores. The traverser and the turntables were examined by those who were sufficiently interested; and the course of the coal was seen to the pockets inside the whole length of the walls of the great retort-house, as described by the President in his address. The wall pockets or hoppers will hold the supply for about fourteen hours' working of the whole house. The simplicity of the manner in which they are replenished from the elevated line outside the house and the scoops fed at the outlet from the pockets inside the house, makes this a most economical arrangement—in fact, to it is partly attributed the lowness of the working charges at these works. The nearest approach to this system that we have met with is at the Brentwood Gas-Works, as described and illustrated in the "JOURNAL" for April 12 last (see p. 90).

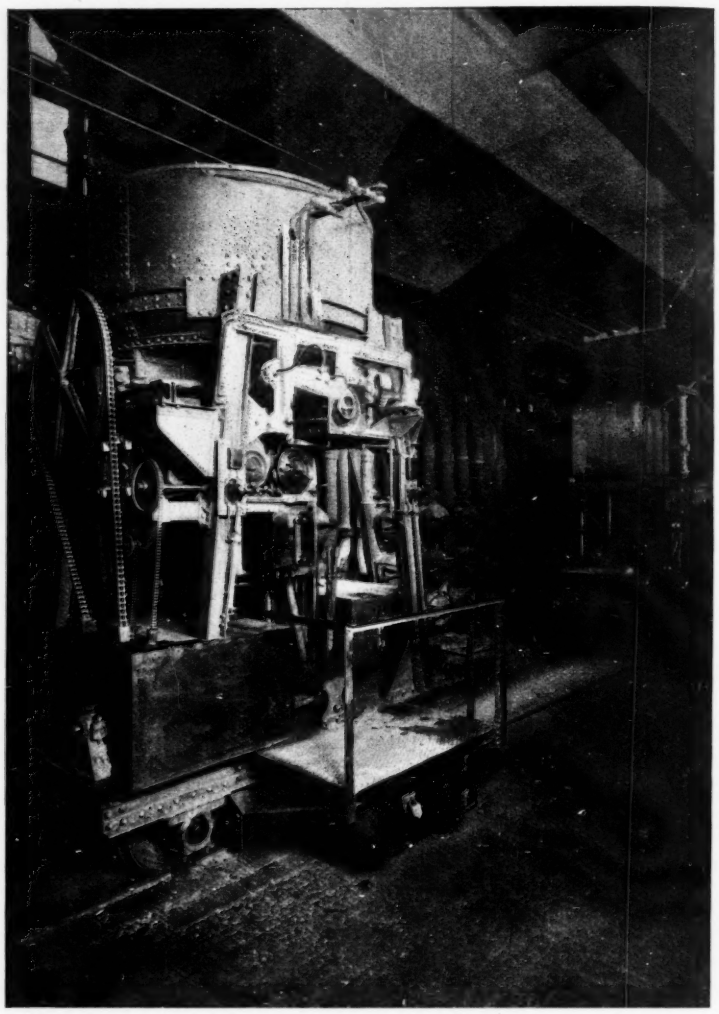


FIG. 2.—THE "PARISIAN" TURBINE CHARGER AT HANOVER.

Entering the large retort-house, it is found to be a building some 88½ metres long by 21·3 metres wide, and down its centre run the forty beds of nine Ω-shaped retorts. These are through retorts, but half of them are blocked (with a half brick) in the centre. The other half are now being worked as throughs with the Parisian machines, of which there are a pair in use—the turbine charger and the pusher (figs. 2 and 3). As stated in the President's address, the turbine charger and pusher were built by the Berlin Anhalt Machinen Actiengesellschaft. The machines are still only working experimentally as it were, as they are intended to deal with the whole of the forty beds, but at present are only engaged (as said just now) on twenty. The machines are driven electrically; the current being taken from the Tramways Company. It is supplied

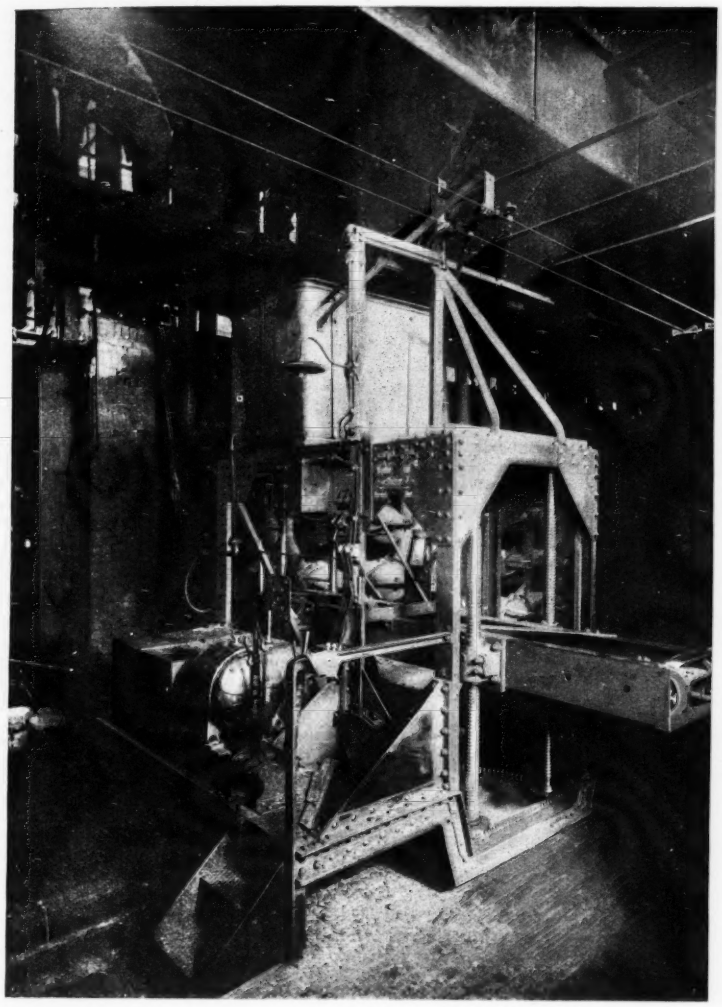


FIG. 3.—THE "PARISIAN" DISCHARGING-RAM AT HANOVER.

at 550 volts; but this is too high for these machines, which are arranged for 230 volts. Instead of putting in a transformer, a second dynamo has been adopted; and the one dynamo is now being driven from the other. This has been found to be much more economical than putting in a transformer. The electricity, it was gathered, is cheap. The Tramways Company only charge 2 pf. per hectowatt, and will give a discount for a larger quantity. The feeding arrangements for the machine consist of a coal breaker and elevator of usual form, with a band conveyor running along the top of the overhead hoppers. The breaker can be fed directly from the railway line outside the house, or (by means of small trucks) from the store. The producing capacity of the house is about 100,000 cubic metres; and so approximately 330 tons of coal are required per twenty-four hours. The overhead hoppers are now about being completed. They are continuous in form (so that coal can be taken from them at any point), and are carried on girders running from the retort-house wall to the top of the bench. They are constructed to take 160 tons, which is equal to twelve hours' supply. The hopper carried on the machine is capable of feeding three retorts. Into each 20-feet retort, a charge of 500 kilos can be put; and this is carbonized in six hours. The machine, however, has not yet been used with that regularity and under those conditions that enable anyone to speak with certainty as to its performances. The charger puts in a very fine layer, but the coal has only up to the present been broken by hand, so that it is not so uniform as it will be when the breaker is working. Then as to the time occupied in charging, the machine hopper has up to the present time been filled by a hydraulic lift; and so altogether the machines and those in charge of them have been hampered in respect of the amount of work they can do. The coal used, too, is Westphalian. This is a very irregular coal—being partly large lumps mixed with a considerable percentage of fine dust. This again puts the machine to a very severe test. Yet the layers are reported to be good. With regard to the pusher, it was learnt that it has not been in use to any great extent up to the present time; but one gentleman present who has had experience of the working, was heard to express the personal opinion that the ram is rather too rigid. The coal used here is a soft one; and certainty as to the reliability of the ram with such charges does not characterize the replies to inquiries. But it is found that the machine charges are very much denser, and the coke is much closer and firmer, than in the case of the retorts charged by hand; so this is in favour of the ram. However, under the circumscribed conditions and the intermittent working of the machines so far, it is not fair to judge of their working until the overhead hoppers are completed, and the machines are allowed their "full swing."

Well, now, the greatest novelty on the works is the Eitle "Kobold" charger and the "Schlange" or corkscrew discharger, of which we give photographic views, also taken at Hanover last week (figs. 4 and 6).* There are two forms of the Eitle charging-machine, which is of the turbine type, in use; but the one first referred to is that which is combined with an elevator, with all parts carried on one frame. The idea of having these several machines in use is to try them, and the best will eventually win so far as Hanover is concerned. The Eitle charging-machine is, a short experience proves, very much adapted to ordinary work. From simple observation, one can say that the machine is light, and is doing its work exceedingly well; and, from hearsay, it must be written down as being very cheap. In fact, a pair of machines only costs £350; so that engineers can make comparisons for themselves. The retorts on which they are working have been in use some 1600 or 1700 days, and two or three which were looked at had sagged considerably in the centre, and were cracked; but, considering these things, the charging was being done to satisfaction. For trial purposes for the present, three beds have been fitted up. The charger (fig. 4) is built entirely in a simple framework of channel iron; and the whole is suspended from overhead rails. If the illustration is glanced at, it will be seen that the coal can be taken direct from the store through the partition wall into the hopper at the foot of the little bucket elevator, and raised into the overhead hopper above the turbine. The charger itself is almost an insignificant-looking object. But it does its work; that is the main thing. From the machine hopper the coal is dropped into the chamber below, and is fed from there into the charger, which (as said) is on the turbine principle. At first, the coal was fed directly on to the wings of the charger; and this quickly destroyed them. A change has, in consequence, been made. The stream of coal is now divided into two parts, and is sent in at the bottom of the chamber in which the turbine works. It is altogether a very neat arrangement, and simplicity is its leading feature. The elevator and charger are worked by different motors. The one which operates the elevator and traverses the machine along the overhead rails is of 3-horse power; and that for the turbine is of 5-horse power. The driving wheel is worked by a small plain friction wheel (which enters into contact on the outer surface of the rim), and is simply covered with millboard. This friction-wheel can be disengaged from the driving-wheel merely by the movement of a handle; and it is itself driven directly from the motor without the interposition of any other mechanism. The principal reason governing the provision of an arrangement for being able to engage and disengage the driving-wheel readily is that the motor used for charging is employed for lifting the charger up and down for the different rows of retorts. Ordinarily the motor would be, when the machine is in use, running continuously; and, by the movement of a single lever, the driving-wheel is engaged or disengaged as the case may be. The machine (which works very smoothly) is used for charging single retorts; but the inventor, who was seen at Hanover, informs us that, by increasing the speed, the same machine is quite capable of dealing with 20 feet retorts. A single corkscrew drawer cannot, however, discharge such a length of retort, unless the house is of unusual width, and so allows of the screws being made of sufficient length to draw more than 10 feet of retort. Inquiry was made as to whether it is necessary to regulate the speed of the machine when charging; and the inventor explained that, as a matter of fact, the driving-wheel being a very heavy one, when the maximum revolution is reached at which the coal is introduced into this charging-turbine, then, of course—the wheel being so heavy—the velocity is naturally slowly reduced by the friction caused by the coal, and it is found that this is quite sufficient, in charging retorts of 3 metres in length, to gradually reduce the speed so that the charges lie evenly. There is another condition which effects the slowing down of the speed; and it is that the introduction of the coal from the sides into the bottom of the turbine (as previously explained) causes the turbine to work, to a certain

* Illustrated descriptions of these machines appeared in the "JOURNAL" for Oct. 6, 1903, and April 5 last.

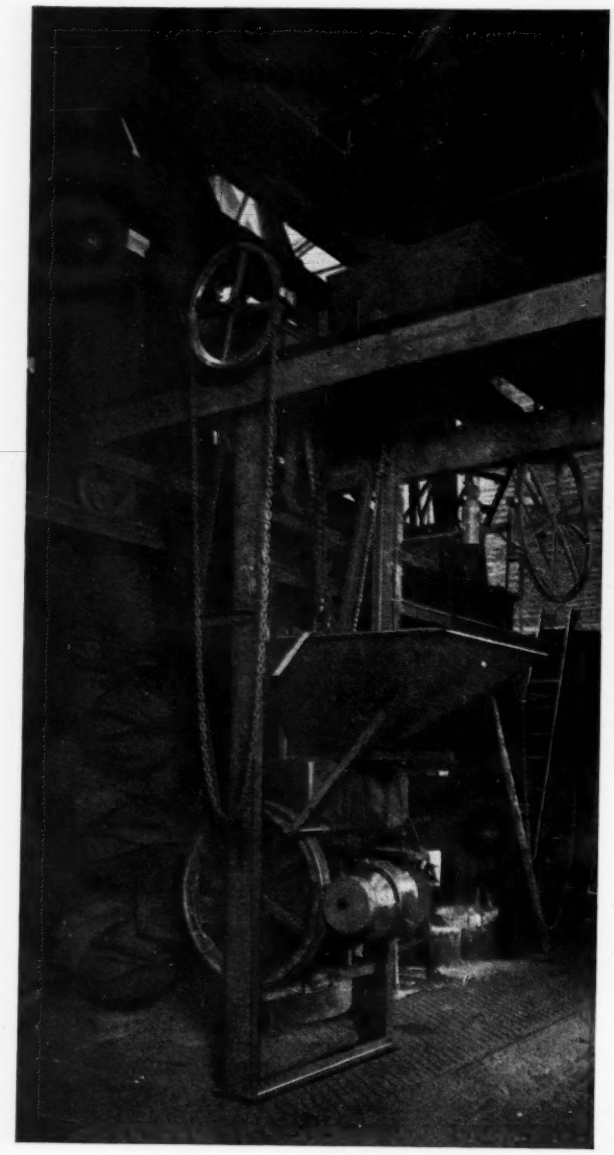


FIG. 5.—THE EITLE "KOBOLD" CHARGING MACHINE, AS FED FROM FIXED OVERHEAD HOPPERS.

degree, as a ventilator—it draws the coal in, and the lower the velocity, the smaller the quantity of coal which enters. Nothing else is done to ensure an evenness of charge. With 6-metre retorts, these controlling influences would not be sufficient, on account of the higher initial velocity at which the machine would have to run.

The second charging-machine of this type (fig. 5) is working on the opposite side of the house; and it is even simpler than the one just described, as the machine hopper is fed from the continuous overhead hoppers—this being the side of the house on which the Parisian machines are working. This little thing looks odd in comparison with the Paris type of machine. In this case, however, the turbine arrangement is raised and lowered by hand, and not by a motor; there being only one motor on this form of machine for driving purposes. As the coal has to fall some distance, and in order to prevent it and dust escaping in its descent, the machine is provided with a spring shoot covered with cloth, so that it works concertina fashion as the charger is raised and lowered. There is also a device for showing the operator when the proper amount of coal is in the charger hopper. This is all that can be said at present about these machines; they having only been in use for a few days.

But what about the corkscrew drawing-machine—fig. 6? This, too, was working on the before-mentioned crooked retorts; and it was reported that it has fetched the spent charges out clean and in a manner that no ram could do with retorts of such character. But the trials at the time of the visit of the members were unfortunately not entirely confirmatory of this. In the patent for these drawers, Mr. Eitle specifies one, two, or three screws—one for round retorts, two for Ω-shaped retorts, and three for (say) a very wide oval or high retort. The machine at Hanover has two screws, working concentrically. It is built up in a simple supporting framework of channel iron; is 15 feet long over all, from front to back, and the frame in which the corkscrews work is some 3 ft. 6 in. wide. These screws are driven by a small electric motor carried on the machine. The first idea that occurs to one is that the corkscrew discharger will crush up the coke; and this the short experience at Hanover shows is the case—the breeze for a given amount of coke being greater than by other methods of drawing.

As we have a photograph of the purifier-house, a few words may be given in addition to the description appearing elsewhere. There are two sets of four purifiers. Each is 8·23 metres by 10·98 metres, and 1·53 metres deep, and has a surface of 90·36 square metres. The first set of purifiers was built by Messrs. C. & W. Walker, and was fitted with their centre-valve; the second set was built by a German firm, and is fitted with a Weck's centre-valve, also made by Messrs. Walker. The practice here is to use one layer of lime at the bottom of the boxes, and three layers of oxide above. The limitations of 22 grains of sulphur per 100 cubic feet of gas, and not more than 2 per cent. by volume of carbonic acid are imposed all the year round. There is a good broad revivifying space on each side of the purifiers; and an overhead crane, worked by hand, for lifting the covers.

Turning from the works (in which, of course, the new stoking machinery had received the most critical attention, even by not a few of the ladies present), the large company set about in earnest to enjoy to the full the hospitality and entertainment which, as the hosts of the evening, the Imperial Continental Gas Association had provided for them. After being photographed, 850 or more people were soon seated in the huge decorated marquee, and

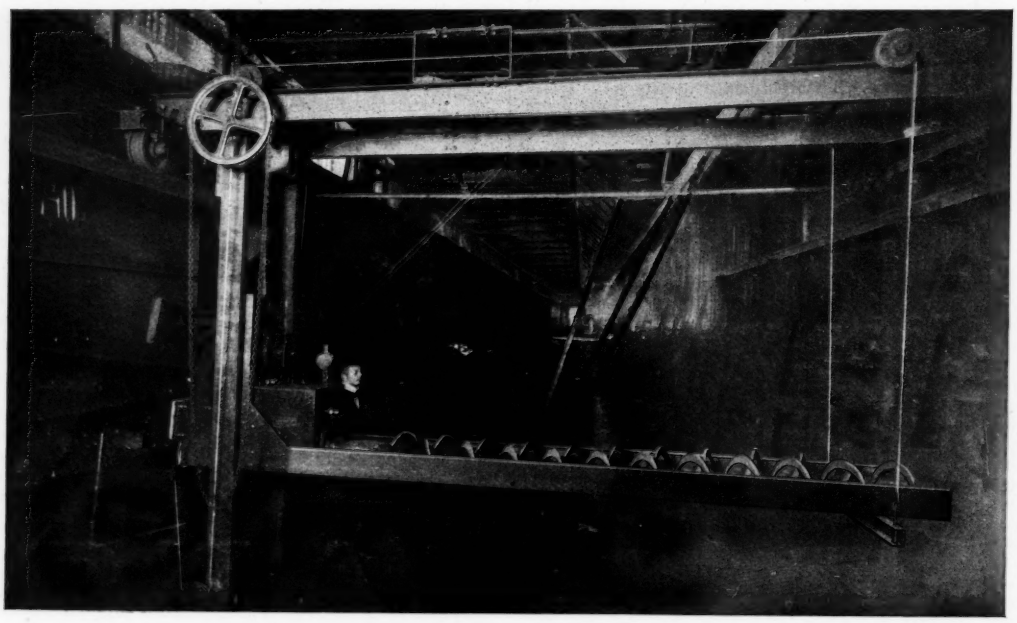


FIG. 6.—THE EITLE "SCHLANGE" DRAWING-MACHINE.

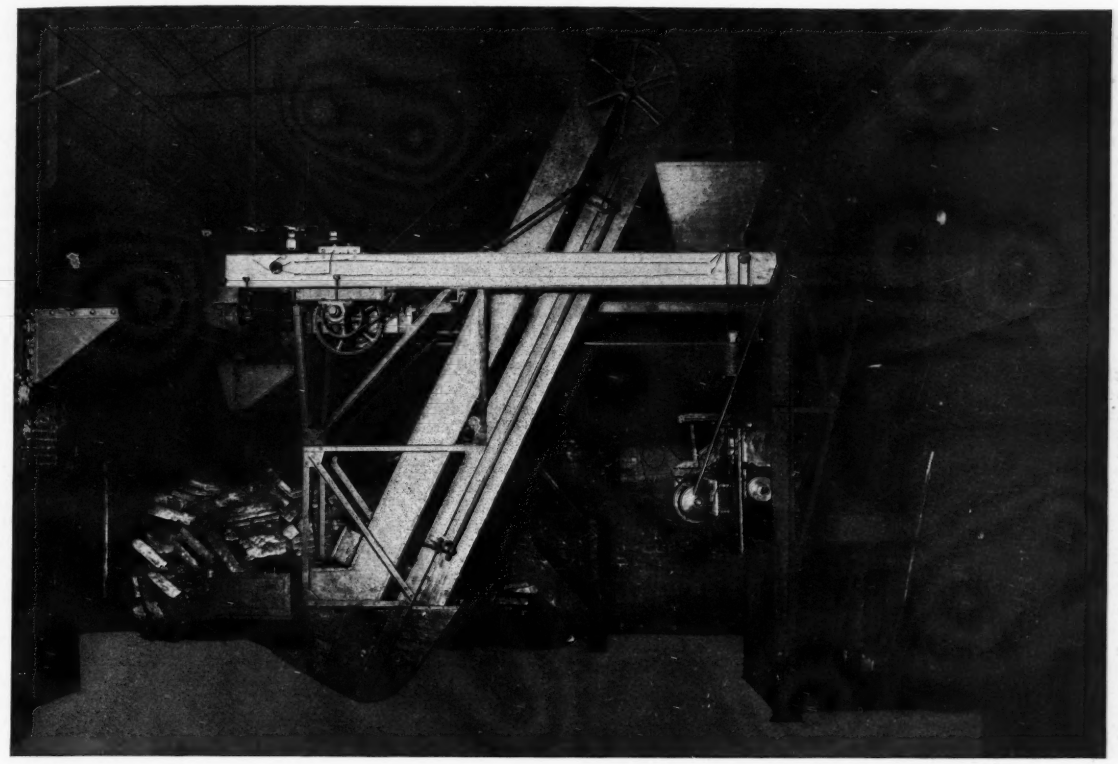


FIG. 4.—THE EITLE "KOBOLD" CHARGER, WITH COAL ELEVATOR AND HOPPER ON ONE FRAME, RUNNING ON OVERHEAD RAILS.

supper commenced. A supper in German style, on such an occasion is not by any means a matter to be lightly treated or regarded; and, when taken among 850 enthusiastic sons and daughters of the Fatherland, it is far from being a dull affair. Speeches by the President and other gentlemen, music by a military band, songs by a beautifully trained choral society, and gymnastic feats by a club (among the members of which were several of the gas-works office staff), whose performances could not have been excelled by professionals, divided the attentions of those present between their plates and the stage. At the end of the centre table sat the President and his daughter, and several of the officials of the Imperial Continental Gas Association—Mr. R. W. Wilson (the Secretary), Mr. H. H. Salomons, Mr. Egeler, Mr. James Drory, Mr. W. J. Brender à Brandis, Mr. Anderson, Mr. Auzboeck, Mr. Pohmer, and Mr. Rudolf. Among the speeches were several by the President—all being appropriate to the occasion, and couched in a humorous style, for which he became quite famous during the week. In one, he gave a very hearty welcome to the guests in the name of the Imperial Continental Gas Association. He also referred to England as having been under the dominion of Hanover in 1825; but stated that since that year Hanover has been indebted to English management for its gas

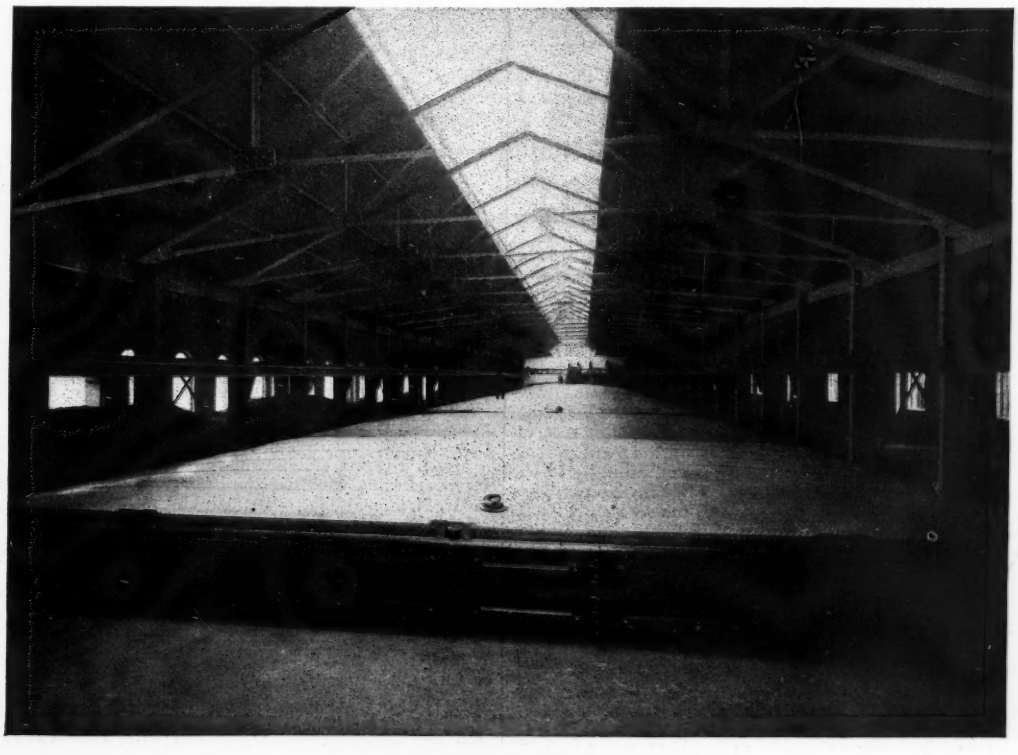


FIG. 7.—THE PURIFIER-HOUSE AT HANOVER.

supply. He spoke of the very friendly relations existing between the Board in London and their Engineers in Germany, and said that, after a life-long connection with English people, he was able to value their good qualities. He believed that, if all Germans were in the same position as himself, there would never be even any superficial friction between the people of the two countries. As an evidence of the goodwill which exists between the German Association of Gas and Water Engineers and the Imperial Continental Gas Association, he mentioned that, on the Executive Committee of the former, there are two of the Engineers of the atter—Mr. William Drory and himself. Herr Grohmann replied on behalf of the guests; and, in his observations, he remarked upon the fact that, though the Hanover Gas-Works are old in years, they have been kept up to the height of present-day practice in regard to efficiency. From the earliest times, he added, the Imperial Continental Gas Association have surrounded themselves with excellent engineers; and what is a noteworthy fact, the descendants of these engineers also take service with the Association—as examples, he mentioned the Körting and Drory families. A further point in his speech was that Hanover was one of the first towns on the Continent to be lighted with gas. Quite an interesting and exciting interval was provided in the proceedings, when, headed by the band, the whole of the numerous company marched out of the marquee and in procession through the grounds attached to Mr. Anderson's house adjoining the works. These were beautifully decorated with Chinese lanterns, fairy lights, and incandescent gas-lamps. On the garden side, portions of the house were outlined with gas-jets; and a central feature was a device, from which blazed forth the letters I. C. G. A. The march round was much enjoyed, and the scheme of decoration was greatly admired. Both Mr. and Mrs. Anderson must have devoted themselves untiringly to the work of preparation, to have obtained such a fine and beautiful effect. Then the entertainment was resumed in the marquee; and, at quite a presectable hour, the President said the parting word. Before the visitors left the works, however, there was a modest but pretty display of fireworks in the yard. Shortly afterwards, they passed once more under the temporary entrance archway, from which they were greeted but a few hours previously by trumpeters, and on which stood out in bold letters the word "Willkommen." Looking round, on all hands there were seen evidences of the happiness and delight that had been experienced from and through the arrangements made by the hosts for the evening's enjoyment. It must be added that the gas-works staff had worked faithfully and hard to do justice to their chief and themselves, and to bring honour upon the Imperial Continental Gas Association. And they abundantly succeeded.

On Friday evening, there was a great banquet at the Tivoli, when again music, song, speech, and toasts ran through nearly the whole of the courses. The President was again in the chair; and there were several local notabilities present. It was a very brilliant success.

The week's events ended on Saturday, when, although wet at the hour of starting, the major portion of the visitors left Hanover on one or other of three trips—the two principal being to the petroleum wells at Wietze and to old-world Hildesheim. Thus terminated the second Hanover meeting of the German Association of Gas and Water Engineers.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Rather more than twenty members accepted the invitation of the President of the Association (Mr. W. Hill) to visit the Stalybridge Gas-Works last Saturday. They were met by Mr. Hill and several members of his staff, and conducted through the works, of which the following is a description: They cover 2½ acres, and are capable of producing 1,180,000 cubic feet of gas per day. The coal is carted from the hoppers belonging to the Joint Railways (London and North-Western and Great Central), which are nearly a mile from the works; also from the canal wharf, a quarter-of-a-mile distant. The storage capacity is equal to about 3000 tons. There are two retort-houses. No. 1 is 87 feet long and 60 feet wide, and contains eight settings of nine retorts 21 in. by 15 in. and 20 feet long; No. 2 is 85 feet long and 48 feet wide, and it contains six settings of nine retorts, 22 in. by 16 in. and 10 feet long. All are heated by regenerative furnaces. The hydraulic main is constructed to allow the tar to run from it into a receiver, and subsequently work with a water-seal. When the gas leaves the main, it is conveyed in 12-inch and 16-inch foul mains, fixed on the inner walls of the retort-house, then along the coal-store wall to the condensers, which are of the horizontal type, consisting of 16-inch pipes in five double rows 65 feet long. There are three exhausters, one of them (Anderson's) having a capacity of 30,000 cubic feet per hour; another is one of Messrs. R. & J. Dempster's rotary exhausters of like capacity; and the third is one of Messrs. Waller's, also of the rotary type, capable of passing 40,000 cubic feet per hour. There are two boilers—one a Lancashire, 28 feet long and 7 feet in diameter; and the other a Cornish, 14 feet long and 4 ft. 6 in. diameter. This is fitted with a Meldrum furnace, the fuel used being generally breeze from the coke. One of the washers is a Livesey, of 500,000 cubic feet capacity; and the other is one of Messrs. C. & W. Walker's washer-scrubbers, of 750,000 cubic feet capacity. There are two tower scrubbers, 44 feet high and 6 feet diameter, filled with canvas grids, and one of Holmes's rotary washers, 1¼ million capacity. Of the purifier-houses, No. 1 is 90 feet long by 34 feet wide, and is arranged with ground floor. It contains four purifiers, each 20 ft. by 30 ft., having two covers per box (Greene's type), with discharging openings at the bottom. The ground floor is used for revivifying the oxide. A brake hoist arrangement is used for elevating the purifying material into the boxes. No. 2 house is 42 feet long by 28 feet wide, and contains two purifiers, each 20 ft. by 16 ft., of the old type. The station meter was made by the Gas-Meter Company, and has a capacity of 30,000 cubic feet per hour. There are four holders. No. 1, single lift, has a capacity of 226,290 cubic feet; No. 2, double lift, 280,973 cubic feet; No. 3, triple lift, 251,532 cubic feet; and No. 4, also triple lift, 736,460 cubic feet—making a total of 1,495,255 cubic feet. Two of the governors are of Braddock's ordinary type, the pressure being regulated by weights; and one is a Peebles governor. The sulphate plant is by Messrs. R. & J. Dempster, Limited, and is capable of producing five tons of sulphate per week. The following general particulars were supplied to the visitors: The Stalybridge Gas Company was formed in 1829; and the Stalybridge Corporation Gas Bill, under which their works were acquired, received the Royal Assent on July 30, 1885. The length of mains is 38 miles, and the diameters range from 2 to 18 inches. There are 4000 ordinary and 1700 prepayment consumers.

After the visit, Alderman Ridyard, the Chairman of the Gas Committee, who had joined the party during the afternoon, expressed his regret at not being able to accompany them to the water-works.

Mr. BERRY (Hyde) moved a vote of thanks to Alderman Ridyard and the Committee.

Mr. GARLICK (Salford) seconded the motion, and it was carried.

Alderman RIDYARD, in reply, remarked that the Committee could not show the members exactly model gas-works, but what they had were very effective. They had recently reduced the price of gas from 2s. 4d. to 2s. 3d. per 1000 cubic feet, and had handed over to the relief of the rates a sum equivalent to 3d. or 4d. in the pound. They had no need to be ashamed of this, and he did not think the Committee were so vain as to take the credit all to themselves. Mr. Hill, the Engineer and Manager, started at the gas-works through his successes at the Technical Schools, and he (Alderman Ridyard) was very pleased to know that he was now the chief. Many of the members of the Association were young, and their aim was to be gas engineers; and he hoped they would become excellent servants to some local authority.

Waggonettes were in waiting at the works, and the party were taken to the Swineshaw reservoirs of the Ashton, Stalybridge, and Dukinfield Water-Works Joint Committee. On arriving at the first reservoir, the party went through the valley to the head keeper's lodge, where tea was partaken of. After tea the members walked to the top reservoir, which is nearly 1000 feet above sea level. A description of the reservoirs (in pamphlet form) had been given to the members, and was very useful. Returning to the lodge,

Mr. HILL said he would have liked to say something about the remarks made by Mr. Cranfield, the President of the Yorkshire Junior Association; but he would have to leave this to a later date. He fully endorsed in every way what Mr. Cranfield had said. But there was no doubt the lines were similar to those drawn up by them for the Senior Association to consider some time ago; and they were the people to look to for success.

Mr. GARLICK said he thought Mr. Cranfield's ideas were practically the same. He went on to remark that he had noticed latterly a lack of discussion at their meetings. He would not like any member to get the idea that he would not be listened to; and he hoped more members would come forward with papers.

Mr. GINMAN said they would all agree with him that the idea of a library was a very laudable one, as they did not all possess the means to have one of their own. When it took practical shape, he, for one, would contribute to it. He would also promise a paper for the next session. He thought they ought to try to have a syllabus arranged for the whole season. The Council could not do much themselves; it rested with the members to keep up the meetings to the high-water mark. He begged to thank Mr. Hill and the authorities of the Stalybridge Corporation for their courtesy, and wished them success.

Mr. J. TAYLOR (Hollinwood) supported these remarks. The members would look back on the visit as a very enjoyable one.

Mr. HILL suitably responded, and the party were driven to the station after spending a most pleasant afternoon.

The Gas, Water, and General Investment Trust have elected Mr. HERBERT E. SALT (son of the former Chairman) as a Director; Mr. J. A. Kelman having retired from the Board.

Mr. F. D. RICHMOND, who for the past four years has been at Lea Bridge, has been appointed Manager of the Heckmondwike Gas-Works, in succession to Mr. A. F. Goodson.

In the official list of "Presentations to Court" last Wednesday, the name of Mrs. MAURICE GRAHAM, of Apperley Bridge, Leeds, appeared, as introduced by the Dowager Lady Barclay.

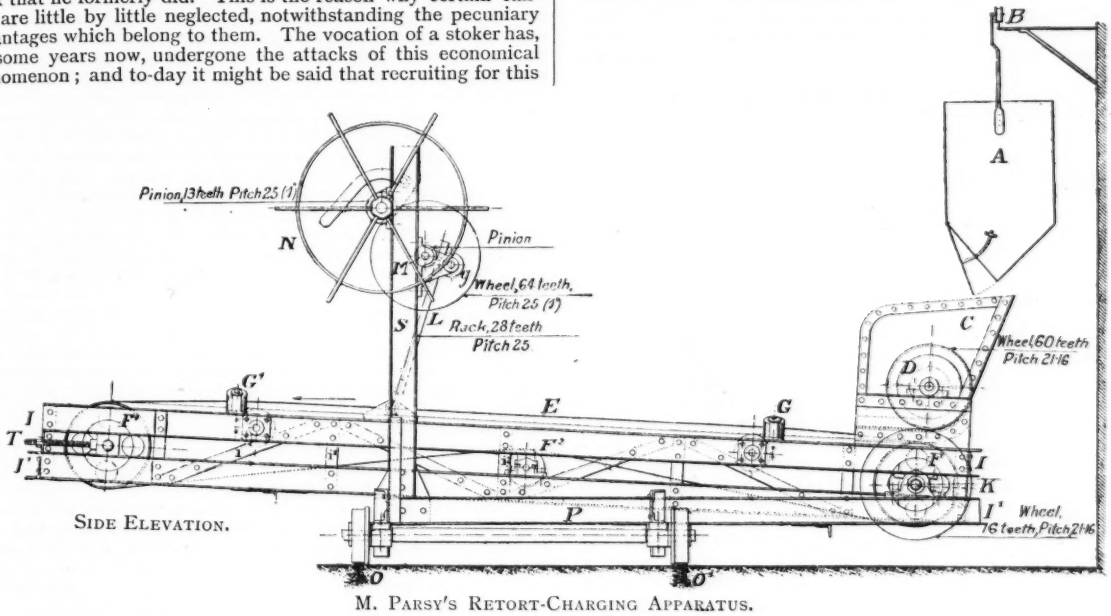
AN ELEVATING-CHARGING MACHINE.

By M. Parsy.

[A Paper read on June 15 at the Societe Technique Meeting.]

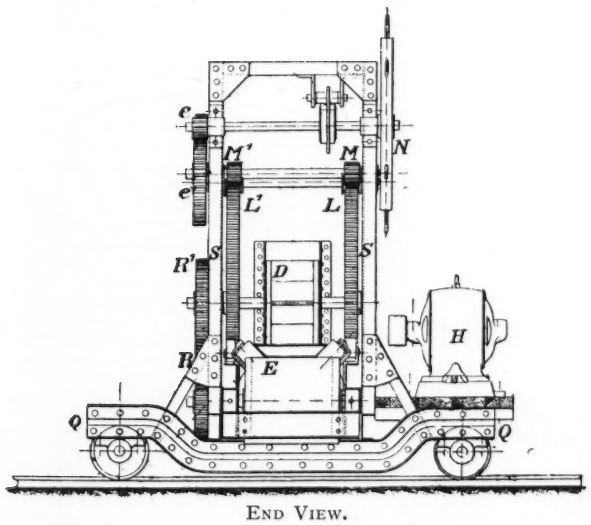
There is a general movement, which has been evident for some years past, in the gas industry in favour of mechanical means for charging retorts. It extends even to works of second-rate importance. The causes which have brought about this feeling are social and economical. Indeed, the pretensions of the workmen—which are unceasingly mounting up—show themselves not only by increases in wages, but also by a continuous improving in the conditions of working. In spite of his higher pay, the workman is less and less inclined to bind himself to the hard and difficult work that he formerly did. This is the reason why certain callings are little by little neglected, notwithstanding the pecuniary advantages which belong to them. The vocation of a stoker has, for some years now, undergone the attacks of this economical phenomenon; and to-day it might be said that recruiting for this special labour would be impossible in many works, had not ameliorations, previously unknown, been effected in this class of work, and made it easier for the men engaged in it.

There are now two systems before us: One, inclined retorts, due to the notable and ingenious initiative of our distinguished colleague, M. Coze, whose experiments date from the Bordeaux Congress of 1885; and the other, the various types of charging machines for horizontal retorts, from the simple scoop worked by hand or mechanically, to the projecting machines which at the present time are attracting the attention of the gas world. It is possible that before long the vertical retort may put everyone in agreement, for its working is being investigated at this moment from different quarters, and very encouraging results have already been obtained. However, it is still in the experimental stage; and it has yet to undergo the test of actual practical working, which is always the real touchstone of commerce. Meanwhile,



Side Elevation.

M. Parsy's Retort-Charging Apparatus.



End View.

as the question seems to impose itself upon us as an unavoidable consequence of social necessities, it concerns us to solve it under the best and most economical conditions for our industry. It is still a problem full of unknown quantities, because the possible reduction in the net cost of carbonization arising from labour expenses only allows a small margin in which to record the cost of upkeep and amortization of the considerable steel constructions which all new mechanical installations necessitate. There exist under this heading pitfalls which make it difficult to value future financial results. Actuated by these considerations, the author has tried first of all to arrive at a machine of small cost, and the use of which would not seriously modify existing plants, to which it could be easily adapted.

The apparatus about to be described has these qualities, inasmuch as, for its working, there is no need previously to elevate the coal into distributing hoppers. On the contrary, without leaving the retort-house floor on which it stands, it can be fed directly by small waggons coming from the coal-stores. By itself, it lifts the coal to the level of the retort to be charged. As its name indicates, it is an "elevator-charger." The two parts of which the machine is made up are well known. The projector with web-plates has been made a speciality of for several years, especially by the firm of Mouraille. Then at the 1901 Congress, our colleague M. Cabrier showed an interesting charging machine combining at the same time a web-projector and an endless belt running on two rollers.*

The originality of the new charger now described arises from the fresh arrangement which has been given to these two parts, and in interchanging the order in which they work. The projector feeds the belt, which then, by friction, secures the carrying of the coal. The projector, placed on the ground-level of the retort-house, receives the coal directly from the skips coming from the works stores. It throws it first of all on to the belt, which then carries it up to the mouthpiece of the retort; the required height being allowed for, and the necessary speed being given so as to make the charge. The *ensemble* of the apparatus might be compared to a fire-pump, the main body of which does not leave the ground, while the jet can be directed by a moveable channel to the different floors which have to be reached.

The following is a description of the apparatus: The coal brought from the store by a skip A running on a single rail B, is discharged into the sheet-steel hopper C, in which is a projector made up of a wheel with cast-iron division plates D, which, revolving at a high speed, throws the coal on to the endless belt E. This winds on the rollers F and F' in the direction shown by the arrow. The edges of the band are raised by inclined rollers G G', so as to form a sort of gutter, in which the coal is carried along at the speed given to the belt by the roller F, which itself receives its motion from the dynamo H placed on the carriage of the machine. The two rollers F and F¹ are built up on a framework composed of two cheeks, each formed of two U irons I and I', fastened together by *i*, *i'*, *i''*. This framework can be moved on the shaft K of the motor-roller F, in such a way that its other end can reach the different levels of the retorts to be charged. This rotatory movement is obtained by means of two racks L and L', which, turning on the rollers *g*, are actuated by the two pinions M and M', and gear in their upward course with the cheeks of the framework to which they are connected. The pinions are worked, by means of gearing *e e'*, by the controlling wheel N. All this arrangement is mounted on two vertical supports S between which is placed the belt. The tension of this is obtained by adjusting screws T, which work

* See "Journal," Vol. LXXVIII., p. 393.

in the plummer-blocks of the front roller F'. The small roller F'' serves to raise the belt above the carriage. The whole of the apparatus rests on a carriage running on rails O O', for the purpose of effecting longitudinal movement in front of the bench. The framework of the machine is connected to this carriage by the plummer-blocks of the shaft K of the motor-roller F; and they are fastened on to the two irons P, which, with the built-up angles Q, form the whole framework of the carriage. The speed of the projector is made jointly in agreement with that of the conveyor by the gearing R and R'; and the hopper C fixed on the framework follows its inclined movement, which ensures the inlet of the coal on to the band at the same relative speed and at a constant angle.

The regularity of the charge can be obtained in two ways—either by varying the angle at which the projecting of the coal into the retort is being done, or by altering the speed of projection by the motor. The great advantage of the apparatus, as stated above, consists principally in the fact that it is fed from the ground level. It raises the coal itself to the height of the retort to be charged, which does away with all the elevators, conveyors, overhead hoppers, and measurers which make up the large part of the expense in charging-machine plants as ordinarily used up to the present time.

CHARGING-MACHINES AT VILLEURBANNE (LYONS) GAS-WORKS.

By M. Boutan.

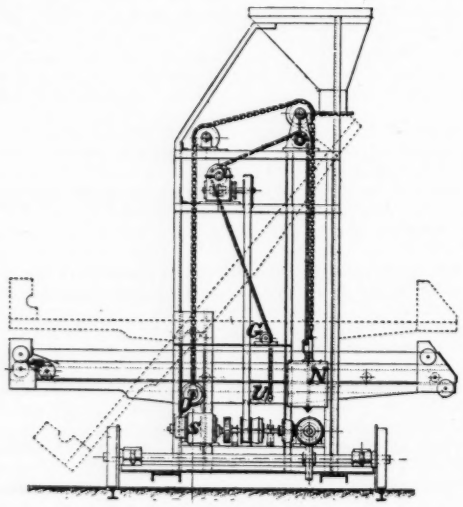
[A Paper read on June 15 at the Meeting of the Solete Technique.]

The Lyons Gas Company, having to increase their works at Villeurbanne—where there were, besides ordinary arches, two benches each of six regenerative beds of eight horizontal retorts—decided in March, 1901, to put up a new retort-house to contain two benches similar to those mentioned, but provided with mechanical means for handling the coal and coke. These mechanical appliances were to be arranged so as in the future to be extended to the old beds. In accordance with this idea, the carrying of the coal is done by an elevator and a band conveyor, transversal to the benches, and throwing the coal on to the return chain of a De Brouwer conveyor, which distributes it in a series of hoppers in front of the arches. On each side of the benches, there is a charging and a drawing machine. The coke is carried away and quenched by a De Brouwer conveyor. All this plant is worked electrically. The drawing machines are of the type used at Marseilles by the late M. Aguitton; the charging-machines are of a special form. The first bench was lighted up in October, 1902, the second some months afterwards; and they have not been stopped since. The mechanical plant has therefore been in use since the autumn of 1902—that is, for more than eighteen months. There has not been any breakdown other than some accidents to the small electric motors, due to the fact that the current used is that of the tramway at 500 volts, with one pole in the earth.

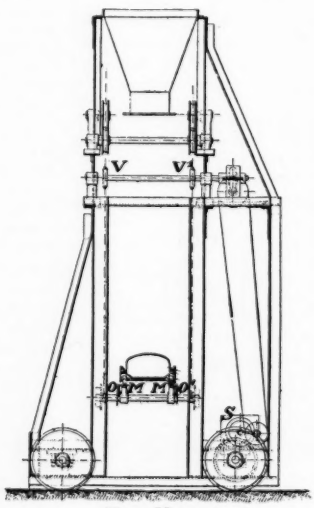
The principle of the charging machines used at Villeurbanne is to make the charge of coal to be put into the retorts into a sort of cartridge, by enclosing it in a rigid tube which can be easily worked. To fill the tube, it is placed in an inclined position; the top part coming under the outlet of the coal-hopper. If desired, the tube can be placed vertically; but a slope of 50° is sufficient for completely filling it. This done, the tube is brought to a horizontal position in line with the retort, and then driven to the end. It is afterwards withdrawn; but the coal is prevented from sharing in this return stroke, for, as the tube recedes, so the coal—being no longer held up—falls by itself on to the floor of the retort. The tube comes out empty from the retort, and can be once again refilled. So as to keep the coal in place during the return stroke of the tube, and to avoid excessive friction, the tube itself is made in two parts, sliding freely one on the other. The upper part covers more than half the section of the coal, and is provided at the back with a plate which forms the bottom of the tube. The lower portion carries a set of rollers intended to facilitate the moving of the whole. When they are joined together, these two parts form a single tube, which is filled at an incline, and charged horizontally into the retort. Once in this position, the lower part is withdrawn. The coal remains in the upper part; but, to the extent that the lower part is drawn back, the liberated coal leaves the upper part and falls on to the retort. Then the top portion can be withdrawn above the coal, without any difficulty, and be placed again over the lower part.

It will be noted that the running off of the coal is caused by the relative displacement of the lower part of the tube in connection with the upper part. If, therefore, the upper part is kept absolutely fixed, all the coal contained in it remains in the retort; but if it is allowed to have a regular return movement, the amount of coal dropped at each point is only due to the difference in the speeds of the two parts of the tube, and the charge, while remaining regularly spread along the retort, is reduced as desired—the surplus remaining in the tube. Lastly, if it is wished to have a more or less heavy charge at certain points in the retort, it is sufficient to advance or withdraw the upper part at the moment when the lower part passes the particular place.

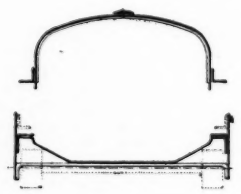
So as practically to carry out these ideas, the apparatus is arranged as shown in the illustrations. The tube, which is the only part to go into the retort, is made up of angles and thin sheets. The lower part carries the rollers, and is made rigid by

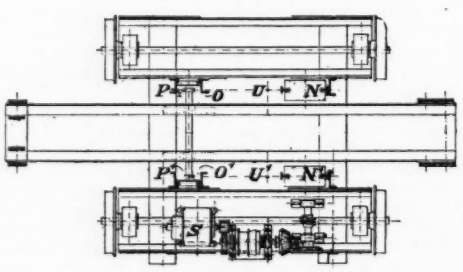


Elevation.

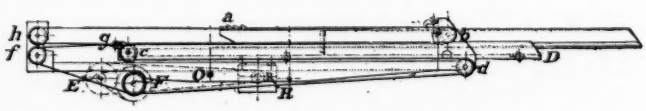


End View.





Plan.



Retort-Charging Machine at the Villeurbanne (Lyons) Gas-Works.

strong stays connecting to the longitudinal angles. The upper part is lighter, and merely strengthened by some flat or half-round irons forming something like a spine and ribs. The two portions slide very easily over one another, and so that dust or even pieces of coal cannot stop their movement. Their inside surface is quite smooth, and has no plate or web, because, at the moment of pulling back the lower part, the coal is absolutely solid in the upper part. But this adhesion ceases automatically when the lower part is withdrawn, and the coal falls the few centimetres which separate it from the floor of the retort. The entire section of the tube is made according to the form of the retort and allows at each side and at the end a play of 7 or 8 cm. (about 3 inches) so as to give every facility for the ingress of the tube into the retort. The lower part is carried on angles by its rollers —forming a running path M M′. These angles are connected with the bracing of the mechanism, as they have to stand the forward and backward movement of the tube. The whole is carried at O O′ and U U′ by suspended chains, and is balanced by counter-weights N N′. The rising and balancing of the sliding path (and so of the tube) is effected by the motor S, connected by a band and endless screw to the axle V V′, which, by its pinions, works the chain U, G, V. For lifting, the chain passing over the return roller G raises the point U; and at the same time the counterweights N, which the chain V N allows to descend, raise to the same extent the point O. In this way, the sliding path rises, while remaining horizonal. But when the axle O has reached the highest point, the pull of the chain V U continuing to be exerted, the vertical movement is altered into one of rotation round the axle O, and the tube becomes placed in an inclined position ready for filling. For this it is sufficient to open the sliding door which closes the bottom of the coal-hopper. When the tube is full, the motor is started in the opposite direction for the down movement. There is, first, a rotation about the axle O; then the sliding pathway reaching the horizontal; the chain V U gets home on the roller G; the counterweights N rise; and the sliding path (with the tube) descends parallel by itself down to the level of the retort to be charged. Apart from the opening and closing of the sliding door of the coal-hopper, the entire operation only requires a single movement on the part of the workman, whatever be the level of the retort to be charged—namely, the reversing of the motor.

The horizontal motion of the tube for going into the retort and for coming out again is obtained by a motor R, placed under the sliding path. It works by hand an auxiliary shaft E′, gearing itself by a chain to a shaft E having two drums T T′. In each of these drums there winds a metal cable of slight section, which, fixed at *a* on the top part of the tube, passes over the return rollers, following the course *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, *a*. The rollers *c* and *g* are on the lower part of the tube; and the others are on the sliding pathway. The two parts of the tube being clamped together at the bottom, and the tube full of coal in front of the retort, the motor is started ahead. It entrains the drums, causing a pull on the chain *e d*, which winds up. The points *a* and *c* then finding themselves fixed by the complete locking of the tube, the latter—running with its rollers at first on the sliding path, then on the floor of the retort—goes forward under the action of the triple purchase *a*, *b*, *c*, *d*. The chain *e f* unrolls at the same time, allowing of the extension of the triple purchase *f*, *g*, *h*, *a*. When the lower part of the tube is stopped against the end of the retort, the upper part, under the force of the purchase *a b*, continues its action for a little, pushing the charge right to the end of the retort. At the same time, a ratchet, working in the teeth *a*, prevents the return back of the upper part of the tube. The motor is then started in a reverse way; and the chain *e f* winds up—pulling on the lower part of the tube by the double purchase *f*, *g*, *h*. When this has returned for the length of the retort, a catch releases the teeth *a*, and the upper part then shares in the backward movement of the lower part, and retakes its place over it, under the pull of the chain *a h*. The entire operation only requires a single motion from the workman—the reversing of the running of the motor. This is effected in not more than 12 to 15 seconds.

It should be noted that the cable system described exists on each side of the tube, and thus ensures an elastic guiding on the back part. These cables do not go into the retort—only the tube has to stand the radiation from hot walls. But, as it is cooled at each operation by the new charge of fresh coal, it has not to bear any harmful rise of temperature.

In practice, we have tried, in order to reduce by half the importance of the counterweights, to double their stroke by tackling at double purchase the chains supporting the sliding path. For this reason, return pulleys are placed at O and U. The chains wind on these pulleys, and their ends are fastened on to points fixed on the framework.

Lastly—in order to open the mass of coal, and to make in the middle of the charge the furrow which hand-charging with two scoops usually gives—the end of the upper portion is provided with a sort of plough-share, mounted on a large joint. When the inclined tube is being filled, this piece goes into the tubes, and disappears in the coal; but when in the retort and the upper portion return back, the plough, on the contrary, straightens itself out, divides the mass, and throws it on to the sides. For the travelling of the machine in front of the bench, the motor S is used, which works by coned-gearing an endless screw connecting with one of the axles.

The counterweights are heavier than the combination of sliding path and empty tube, but lighter than that of the sliding path and full tube. The up-and-down stroke is, therefore, done without any appreciable expense in work. Also, the working of the machine only absorbs very little electricity. Moreover, the two motors are of 3-horse power type, and only work during the movements to be effected. The electrical equipment consists simply of regulating resistances contained in boxes, as enclosed as possible, and of controllers of the ordinary model. The machinist has only to work the handles of the controllers, which ensure the forward or backward starting of the motors with regulated speed as desired, and the lever of the gearing for the general travelling. The management of the machine offers no difficulty, and a simple movement suffices to control it. The coal being deposited at all the points in the retort, the charge at each of these points is necessarily the same, whatever be the state of the retort and the irregularity of its bottom. Likewise, the coal can be in any physical state whatever—dry or wet, in dust or big lumps—it matters little, for all that goes into the tube has to come out in the same way. In particular, the plant does not require a coal-breaker. A grid of large bars placed before the elevator simply stops the lumps that are of abnormal size.

I will not attempt to give here figures showing the economy in labour realized by the mechanical plant just described. Wages, conditions of work, and quantity of coal charged per arch, are too variable from one town to another for any rough comparison of figures to be information of any value. But those interested will find detailed papers on the subject at the Lyons Gas-Works. It may simply be added that in the retort-house provided with mechanical appliances, the stokers' work is much less hard than in the similar retort-houses where the work is done by hand, and the retorts appear to last for a longer time.

These machines having proved very strong, the Lyons Gas Company are now actually adapting them to a bench of ten arches of nine retorts existing at their Perrache works, but arranging them to be used at the same time for ramming out the coke. With this object, the tube made as above described will be 6 m. (20 feet) long, and will go at the same time into the two retorts without ends, placed end to end in the back-to-back-arches. In being driven into the retort, by means of a moveable plate, the tube will ram out the coke; then when the two parts are, in turn, withdrawn, the coal will run out on to the floor of the retort—taking the place of the coke almost immediately. The opening of the retort-lid will thus be reduced to a minimum. A very simple action will allow, of course, of withdrawing together the two parts of the tube without leaving behind any coal, should it be desired to examine the retort after discharging, and the apparatus would then work just like an ordinary ram.

International Acetylene Association.—As at present arranged, on Sept. 14, 15, and 16 (according to an American contemporary, "Light") there will be at St. Louis an International Convention of the acetylene interests of America. It is proposed "to make this a notable meeting, in which home and European contingents will unite in a joint programme." Various forms of application to which the so-called "white light" is adapted will be discussed, and such topics as the "Practical Application of Acetylene and Its Results" will be presented by men of experience and ability. The important subject of "Institution Lighting" will have attention, as well as other matters of much moment. The gathering will be under the direction of the International Acetylene Association of Chicago.

The Southern Association Meeting at Reading.—Given fine weather on Thursday, the excursion meeting of the Southern District Association of Gas Engineers and Managers to the home of their President (Mr. Douglas H. Helps) should be an attractive fixture. An hour's journey from Paddington—starting at 9.45—will enable a long visit to be paid to the Reading Gas-Works; and after luncheon (to which the members are invited by the Chairman and Directors of the Gas Company) a steam launch will take the party down the Thames as far as Taplow, which is timed to be reached by half-past seven. The only formal business to be transacted is the consideration by the members of the affiliation question—a subject on which there is hardly likely to be much difference of opinion, leading to extended discussion by the meeting.

Incandescent Gas Lighting for Schools.—The lighting of school buildings is attracting considerable attention throughout the country; and Mr. William Sugg's paper read before the Institution of Gas Engineers (as published in last week's "Journal") is likely to have a good effect among those to whom is entrusted the provision of efficient means of lighting interiors where any great amount of "eye-work" is performed. It is gratifying to notice that at last Tuesday's meeting of the London County Council the following paragraph in the report of the Education Committee was agreed to: "It was the practice of the late School Board to re-arrange the gas-pendants in class-rooms in old schools where the lighting was found to be insufficient or unevenly distributed, and to provide and fix incandescent gas-fittings in order to improve the lighting. We have had before us the question as to effecting similar improvements in the case of seven [named] schools, and we propose that the necessary expenditure [amounting to £895] be sanctioned for this purpose."

RECENT PROGRESS IN INCANDESCENT GAS-LIGHTING.

At the Congress of the Société Technique du Gaz en France the week before last, several of the papers submitted bore upon the above subject. A translation of one of them, by M. Lecomte, was given in the "JOURNAL" for June 21 (p. 870); and we now deal with two others.

AN INCANDESCENT BURNER (FOR WARM AIR) WHICH CAN BE EASILY CLEANED.

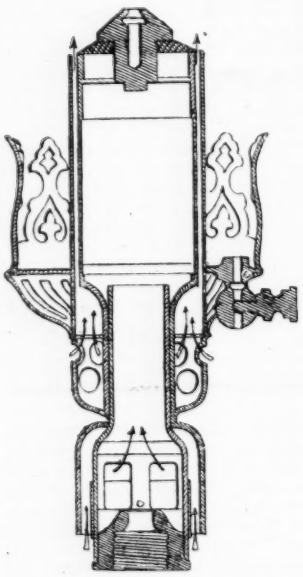
By M. JOUANNE.

In the Lanneau burner, which is the subject of this note, and is shown in the accompanying illustration, the principle of recuperation is introduced by means of a cylindrical sheath fixed around the delivery chamber of the burner. A current of air is strongly heated by contact with the walls of the chamber, and it then passes directly under the mantle, where it greatly augments the intensity of combustion. The construction of the burner allows of the parts being readily cleaned. Gallery, glass, and mantle are removed together and put aside. The exposed burner can now be cleaned perfectly, and the gallery, which forms the heating-chamber for the recuperative air, replaced without the safety of the mantle having been at any time in danger. In the previous type of Lanneau burner, the upper part of the annular sheath was not removable in this way.

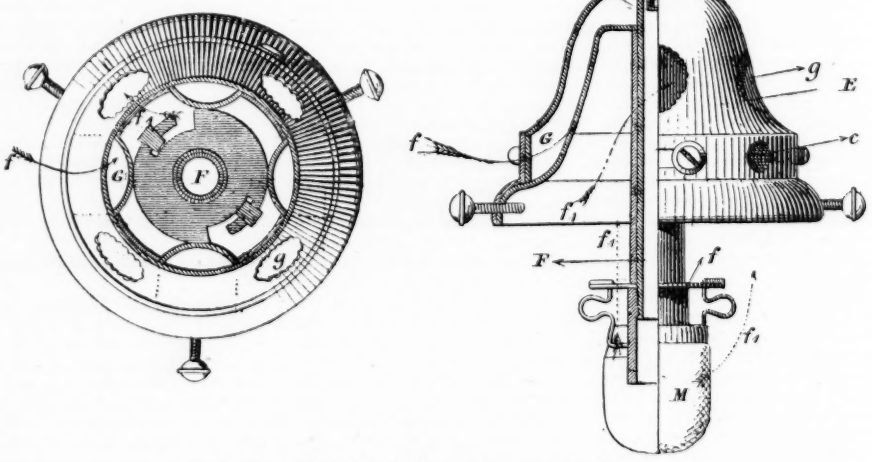
AN INVERTED INCANDESCENT BURNER.

By M. SELLIÉ.

It is claimed for this burner (introduced by the Compagnie Générale d'Appareillage) that it satisfactorily overcomes the two problems of the inverted bunsen—viz., (1) the lighting-back of the flame through the overheating of the mixing-tube, and (2) the shorter flame caused by the products of combustion finding their way backwards up the tube. The burner consists of a bell E, with a tube F as its vertical axis, from which the mixture of air and gas is delivered to the inverted mantle M. Above the tube is the bunsen, supplied with gas at *a* and with air at *b*, through a number of small lateral apertures *c*. These apertures form the ends of chambers G arranged on the inside of the bell. The other ends of the chambers open into the exterior of the bell, and the apertures *c* can be more or less closed by means of a rotating ring provided with openings matching those in the bell. In this way the air supply is adjusted. It enters at *f*, and is warmed in its passage through the chambers by the products of combustion of the burner, which rise through the bell, as shown by the arrows f_1, and escape by the apertures *g*. This entirely separate arrangement for the inlet of the air and the removal of the burnt gases precludes any mixture of the latter with the air. The injector is likewise completely separated from the flame.



M. JOUANNE'S BURNER.



M. SELLIÉ'S INVERTED INCANDESCENT BURNER.

The burner can work at pressures from 25 to 100 mm.; but, like other similar burners, it does not give satisfactory results at high pressures. The two following photometric tests were made with the burner:—

I.—*Burner Adjusted to 70 mm. Pressure.*

Pressure of Gas.	Hourly Consumption.	Horizontal Intensity.	Consumption per Carcel-Hour.
35 mm. . .	69·11 litres	4·12 carcels	16·75 litres
55 ,, . .	86·63 ,,	5·53 ,,	15·65 ,,
75 ,, . .	97·74 ,,	6·50 ,,	15·03 ,,
100 ,, . .	116·68 ,,	6·92 ,,	16·85 ,,

II.—*Burner Adjusted to 25 mm. Pressure.*

Pressure of Gas.	Hourly Consumption.	Horizontal Intensity.	Consumption per Carcel-Hour.
15 mm. . .	63·83 litres	3·82 carcels	16·71 litres
25 ,, . .	87·59 ,,	5·13 ,,	17·07 ,,
35 ,, . .	107·43 ,,	4·91 ,,	21·88 ,,

The figure of 15·03 litres per carcel-hour (horizontal intensity only) is better than that produced by the Farkas burner, which gives a horizontal lighting of 6·22 carcels for a consumption of 102·8 litres, or 16·53 litres per carcel. The Welsbach No. 2 burner also requires from 16 to 16·5 litres for each carcel-hour.

Tested at a pressure of 70 mm. and a consumption of 98 litres, the intensities of the light at various angles was found to be as follows:—

Angle of Luminous Ray.	Luminous Intensity. Carcels.
60° above horizon.	1·45
45° ,, ,, ...	3·10
30° ,, ,, ...	4·44
15° ,, ,, ...	5·34
0° horizontal intensity	6·50
15° below horizon.	7·97
30° ,, ,, ...	8·76
45° ,, ,, ...	8·68
60° ,, ,, ...	8·44
75° ,, ,, ...	8·18
90° ,, ,, ...	8·14

It will be seen from these figures that the best illumination is at an angle of 30° below the horizon, corresponding to 11·19 litres of gas per carcel-hour. On working out graphically the mean spherical intensity and the mean hemispherical intensity for the lower hemisphere, we obtain for the former 6·06 carcels, equal to 16 litres per carcel-hour, and for the latter 8·15 carcels, equal to 12 litres per carcel-hour. This result, due to the recuperative action of the burner, is distinctly better than that obtained with ordinary incandescent burners of similar consumption. The burner has the advantage of not casting any shadow.

The cost of thawing water-pipes by electricity, according to some figures given at the recent meeting of the National Electric Light Association, was as follows, on the basis of 125 house services thawed in Rutland (Vt.): On the average, 17 amperes alternating current at 2200 volts were required, and the average time consumed was 27 minutes. At 10 c. per kilowatt-hour, the current cost was $1·68; and the cost of labour was $1·85, and of teams and drivers 58 c.—making the total cost per service $4·11.

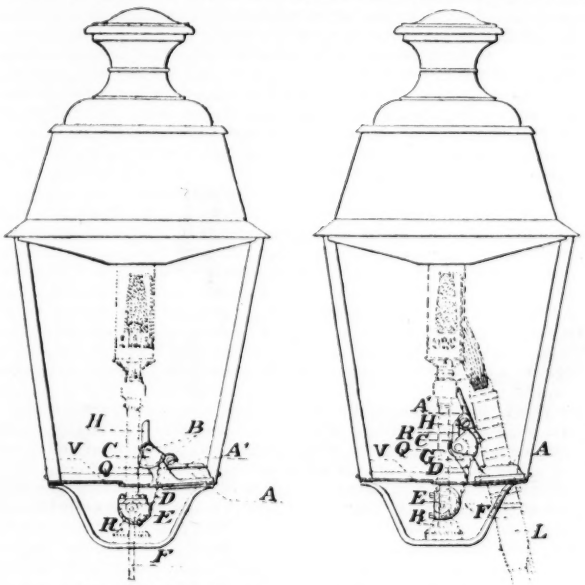
THE AUTOMATIC LIGHTING AND EXTINCTION OF BURNERS.

The above subject was treated at the recent Congress of the Société Technique du Gas en France in three papers, of which the following are abstract translations.

THE "RAPID" SYSTEM OF LIGHTING INCANDESCENT BURNERS.

By M. Tritz.

This system of lighting incandescent street-lamps dispenses with the movement of the gas supply-lever by the lamplighter—a movement which is often none of the easiest, when the lamp is high, and the lever perceived with difficulty in the dark. In the new system, the act of pushing open the flap-valve in the underside of the lantern operates the lever in the following manner: The axis of the valve and the lever are each fitted with a sector piece—a chain connecting the two sectors. When the valve is raised, on the insertion of the lighter's torch, the chain rolls up



M. Tritz's Incandescent Burner Lighter.

on the valve sector, and unrolls from the burner sector; thereby actuating the lever of the supply-cock. When the burner is lighted, the valve falls by its own weight, leaving the chain loose, and the cock of the burner remains open. When the burners come to be extinguished, the supply-lever is operated in the usual way; but this presents no difficulty, seeing that the lamp is lighted. On shutting off the gas, the chain is thereby tightened up again; and the apparatus is once more ready for use.

LIGHTING STREET-LAMPS FROM A DISTANCE.

By M. Casaubon.

The apparatus of which the following is a description provides for the lighting or extinction of a number of self-lighting burners. It can perform these operations in several stages, if required; its action depending on alterations of pressure. The variation required to work the apparatus is 25 mm., and the limits within which this difference may fall are 50 and 130 mm. A reservoir R is filled up to the level V with a mixture of glycerine and water, which is exposed to the pressure of the gas; this pressure also causing the liquid to rise in the box of the float F. The stem of the float carries two flat horizontal discs, between which fits the lever L. The latter terminates, at its other extremity, in two heads S and I, which are separated horizontally by a space of 6 mm. In the vertical direction, they form a kind of hook 7 mm. wide. On one or other of these heads, according to the position of the lever, are supported certain stops fixed to the box of a pendulum spring, which operates, through the ring B, the barrel of the cock P. The heads of the levers are so nicely adjusted, that the float, so to speak, has only to permit, not to produce, the escapement.

To follow the action of the apparatus, take as an example of working where the lighting-up is at 7 p.m., and the gas is turned off partly at 11.30 p.m. and the remainder at 5 a.m. The action will be as follows: During the day, the pressure remaining less than 55 mm., the float is at its lowest point, and the spring is held by stop No. 1 against the lever-head I. At 7 p.m., the pressure rises to 80 mm., and the float lifts, carrying the lever with it. The head I escapes, the spring rotates 80°, and is arrested by stop No. 2 on the head S, lighting then taking place. Between 7 p.m. and 11.30 p.m., the pressure again falls below 55 mm., the float descends, the head escapes, and is arrested by stop No. 2 on I. This gives a rotation of 7° without appreciably affecting the burner. At 11.30 p.m., the pressure is restored for a moment at the works to its normal state. This movement would extinguish the lights arranged therefor; but in the apparatus now under consideration the spring simply turns 14°, and the third stop arrests the head I —the burner remaining lighted. Finally, at 5 a.m. there is a momentary rise in pressure; stop No. 3 escapes from the head I, the spring turns 80°, and the lights are extinguished.

It is clear that the same apparatus will serve for lamps being extinguished at 11.30 p.m. For this purpose, the ring B is adjusted at 90° from the position just considered. By suitably placing the stops on the drum of the spring, the most diverse requirements can be met, such as extinction in three partial stages, extinguishing two out of three burners in a cluster, and so forth.

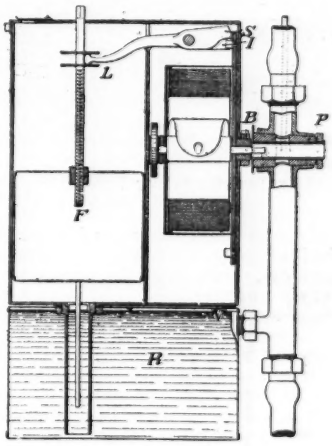


Fig 1.

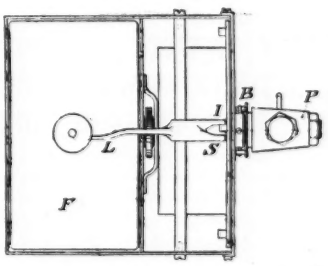


Fig. 2.

M. Casaubon's Street-Lamp Lighter.

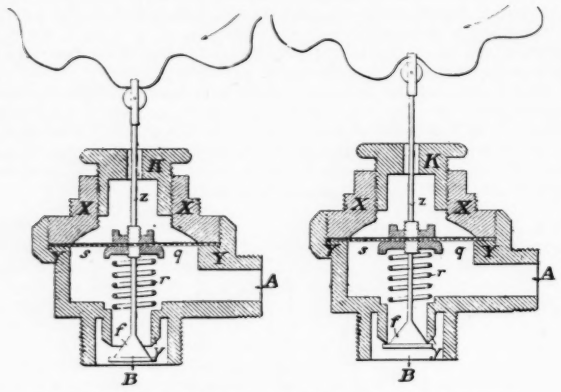
The apparatus is made ready for use again by introducing the winding-key in the aperture provided in the barrel of the cock. The spring will give 18 turns to the drum; and as each complete manipulation for 24 hours only takes half-a-turn, re-winding has only to be done once every 36 days. At the commencement, the pressure should be adjusted to each apparatus according to its altitude, or the diameter of its supply-pipe. The adjustment is made in a moment by giving a turn to the screw forming the stem of the float. This raises or lowers the float in its box, and so alters the pressure required to raise it, without, however, affecting in the slightest degree the action of the lever on the two flat discs.

THE INTERMITTENT LIGHTING OF LUMINOUS STREET SIGNS BY GAS.

By M. Ménagé.

The method adopted for the illumination of street signs at certain regular intervals is based on the use of a wheel or disc provided with teeth or cams, and mounted on a spindle which is rotated by clockwork. By gearing the teeth with the gas-supply cock, the action of the burners can be interrupted as desired. The manipulation of the cock is rather complicated in practice. The apparatus must be accurately made to preclude stiff working, and requires clockwork sufficiently powerful to move the plug of the cock in its barrel. The cock must also be perfectly tight without offering excessive resistance. These drawbacks do not attach to a flap-valve arranged as shown on the next page. An elastic impermeable membrane *s q* is pressed by its edges between two screwed nuts XX and YY, which together form a box and cover. A thin rod *z* passes through the membrane, terminating below in a valve *f*, which takes the form of a simple disc, and closes the

aperture *y* when the rod is raised. The upper part of this rod passes through the metal cap K of the apparatus, and, if necessary, is further guided by a bracket outside. It terminates in a small wheel *r*, which gears into the teeth of the rotating disc. The gas enters the box by the side inlet A below the membrane, and emerges by the opening B, provided by the valve *f*.



M. Ménagé's Intermittent Street-Sign Lighter.

The action of the box is, of course, as follows: When a cut-out part of the disc is above the valve-rod, the latter, being free, rises by its own elasticity as well as by the pressure of the gas in it, and hermetically closes the valve. The second figure shows the state of affairs at the instant of closing. If, now, the disc commences to rotate, the edge of the tooth presses down the wheel of the valve-rod, the latter is depressed, and gas enters and is ignited by the flash-light. The wheel then slips off the tooth, the valve closes, and the gas is cut off. The number and size of the teeth can be varied as required by the intermission of the light, which can be either regular or irregular. The apparatus is simple and portable. the valve offers scarcely any resistance, and the ordinary commercial clockwork apparatus can be used.

INTRODUCTION OF WATER GAS INTO RETORTS IN WHICH COAL IS UNDERGOING CARBONIZATION.

The following is an abstract translation of a communication on this subject made by Herr A. Albrecht, of Furstenwalde-on-the-Spree, and Herr Shirk Boyer, of Berlin, to a recent number of the "Journal für Gasbeleuchtung." The experiments described were carried out at the instance of Herr Zollikofer, the Manager of the St. Gall Gas-Works, in March and April of this year, by the authors, in collaboration with Mr. L. D. Carroll, of London.

A producer setting of eight Ω-shaped retorts, 9 ft. 10 in. long, and 15¾ in. by 23½ in. in cross section, was devoted to the experiments. A service was laid from the water-gas holder (which has a capacity of 12,350 cubic feet) to the setting; and a station-meter was interposed in this service. The service branched into eight 1¼-inch pipes, each with a controlling tap, connected one with each of the eight retorts, so that the water gas was introduced near the crown of the retorts. It was possible by the arrangement adopted to admit almost precisely the same quantities of water gas into the different retorts. Actually, care was taken—by constant control of the flow of gas through the meter, by observation of the fall of pressure, and by corresponding regulation—to ensure that the same quantities of water gas were introduced into the different retorts. No difficulties ensued from stoppages of the distributing pipes, as there was only a comparatively readily removable deposit of carbon round about the mouths of them. This deposit was greater as the heat of the retorts was higher; and it was carefully removed at each time of charging.

The water gas was made in the generator of a carburetted water-gas plant, of the Humphreys and Glasgow type, which was erected at the works in 1900. The gas passed through the washer and condenser, and thence without further purification to the intermediary or relief holder, whence it was delivered into the retorts in the manner already described. It did not, of course, come within the scope of the scheme of work to try all possible variations in respect of the quantity of water gas admitted, the time for commencing its admission, and the duration of the period during which it was admitted. The published accounts of the trials made by Professor Vivian B. Lewes, Herr Borchardt, of Remscheid, Herr Croissant, of Ludwigshafen-on-Rhine, and others, showed clearly that the most favourable results were attained when the admission of water gas was started directly after charging the retort, and was not continued longer than half the time required to work off the charge. The quantity of gas introduced should amount to 40 volumes per 100 volumes of the coal gas evolved by the distillation of the coal. The apparatus used for introducing the water gas was the same as one described by Dr. Bueb as having been used at Güstrow, and as one used at Berne. It was, therefore, a primary object of the authors to obtain at the outset complete agreement of the trials which formed the basis of the subsequent experiments with the researches carried out at Güstrow and Berne. The conditions at St. Gall require the coal gas made there to be of superior quality, and to have a net calorific power never lower than 539 B.T.U.'s per cubic foot, at a barometric pressure of 27·64 inches, while the quality must only exceptionally be as poor as this.

When the trials started, the new Rorschach Gas-Works had commenced work, and were capable of meeting the whole of the consumption in high-grade coal gas; so that the trials were not disturbed by the exigencies of the supply of coal gas. The gas made in the trials was passed, through washing, condensing, and purifying plant, to a gasholder of 85,000 cubic feet capacity, either wholly, or, if not wholly, in a given constant percentage of the total output. From this holder, it was passed, at the conclusion of each series of trials, into the two principal holders of the St. Gall works.

The first, third, and fifth sets of trials were on pure coal gas; the second and fourth on self-carburetted gas. The charges were worked off in four hours; and the introduction of water gas lasted as a rule for one hour. But, on the 30th of March it was continued for an hour longer; and on March 31 water gas was admitted alternately for one and two hours. These variations, however, did not affect the results. The coal-gas trials were to establish the quantity and quality of the gas made in the experimental setting. The conditions of production—such as the weight of charge, the time of working off, the temperature of the setting, &c.—were maintained as nearly as possible the same in all cases. The conditions were those which were the best according to experience at the St. Gall works. Four of the eight retorts in the setting were charged every two hours. The charge was 287 lbs. of Saar coal per retort; and it was drawn in four hours. The coal was taken throughout from the same store; so that its quality was the same in all the trials. Only the day time output is shown in the tables, as the gas made at night time was passed without examination direct into the two large holders. There was an apparatus for carburetting the gas with benzol; but it was intentionally kept out of use, in order that the results might not be obscured by the addition of benzol.

The calorific and illuminating powers of the gas were ascertained by tests extending over the number of hours during which the charges were being carbonized. Two Jünkers' calorimeters were employed for the determinations of calorific power, after they had been several times used in comparative testings on the same sample of gas, and found to give concordant results—*i.e.*, results the difference between which was within the ordinary limits of experimental error in calorimetry. The calorific power of the same gas was determined by the same observer with both the calorimeters. It was essential that their concordance should have been established, because one calorimeter was used for determining the calorific power of the self-carburetted gas, while

Table I.—*Mean Composition of the Gases.*

—	Coal Gas.				Self-Carburetted Gas.				Water Gas Used.	
Set of trials	Nos. 1 and 3.		No. 5.		No. 2.		No. 4.		No. 2.	No. 4.
Samples taken from	Working Main.	Gasholder.	Working Main.	Gasholder.	Working Main.	Gasholder.	Working Main.	Gasholder.	Water Gas Main.	
Number of analyses made	15	5	12	4	12	5	12	5	10	14
Carbonic acid . . . volumes per cent.	2·2	2·2	2·1	2·2	3·0	2·8	2·8	2·9	6·4	5·1
Heavy hydrocarbons . " " "	5·6	5·5	5·4	5·3	4·1	3·9	4·5	4·4	0·5	0·1
Carbonic oxide . . . " " "	7·8	8·1	6·8	6·7	14·1	14·7	15·0	15·5	31·1	34·7
Methane . . . . . " " "	33·1	32·8	34·2	34·3	21·9	21·3	23·8	23·1		
Hydrogen	49·2	49·7	50·0	50·6	52·6	53·5	51·2	51·2	52·0	57·1
Nitrogen and aqueous vapour	2·1	1·7	1·6	0·9	4·3	3·7	2·7	2·9	10·0	3·0

the other was being used on the water gas employed. The samples of gas for analysis were taken in the course of working at equal intervals throughout each trial. The two measuring tubes used in the gas analyses were exactly calibrated; and dual analyses were made on samples of gas to prove that the two gave the same results within the ordinary limits of experimental error.

The photometrical observations were made on an Elster photometer, with a Kruss observing-box of the latest pattern, and an amyl-acetate (Hefner) lamp as the standard light. The gas to be tested was burnt in a Sugg's "London" argand burner, with a chimney 6 inches high, and $1\frac{3}{4}$ inches wide externally. The consumption of gas was regulated to very nearly 150 litres (= 5·30 cubic feet) per hour, which corresponds closely with the normal rate for that burner of 5 cubic feet per hour, since 150 litres under the barometric pressure of 702 millimetres (= 27·64 inches), which is the mean for St. Gall, is within 1 per cent. of 5 cubic feet, or 141·6 litres, under the standard barometric pressure of 760 millimetres (= 29·92 inches). The gas for the testings was taken as required, either from a service connected with the main at the outlet of the station meter, or from a service connected with the outlet pipe of the 85,000 cubic feet storeage holder. The gas was continuously examined as it was being passed from this holder to the two large holders. The water gas was sampled from a service connected with the water-gas main between the 12,350 cubic feet holder and the water-gas meter.

The authors are aware that it is not strictly admissible to test at a uniform consumption gases of such divergent illuminating powers. They have no hesitation in admitting that there is some justification for the views and practice of Professor Lewes in regard to this matter; but they raise the same objections to them as Mr. Shoubridge of the Crystal Palace District Gas Company has done (*see* "JOURNAL," Vol. LXXX., p. 1545). Similarly they only made tests of illuminating power with the same quantities of gas in the "London" argand burner, and put aside the testing of the light obtainable with Welsbach mantles, because, in order to obtain the most favourable effect with mantles with gases of such varying quality, it would have been necessary to use at least half-a-dozen different incandescent burners, and it would have been impossible under these conditions to make the testings on the self-carburetted gas as produced. This will be evident on reference to the table given later, which shows the varying quality of this gas within a short period.

In order to avoid the necessity for corrections of more or less dubious validity, the 85,000 cubic feet holder used for the storage of the gas was, prior to each trial, washed out with gas, similarly made, as often as was needed to leave less than 1 per cent. of the previous contents of the holder in the crown when it was ready for receiving the new store. The gas used in washing out the holder was, however, tested as produced; and the results are included in the summaries. The mean results were thereby somewhat displaced in favour of the self-carburetted gas, and against the neat coal gas. The results of the analyses of the gases are embodied in Table I. The heavy hydrocarbons in the simple water gas arise from it having been passed through the washing, carburetting, and superheating vessels which form part of the Humphreys and Glasgow type of plant.

(*To be Continued.*)

CONCRETE AND PUDDLE FOR RESERVOIR EMBANKMENTS.

By WILLIAM WATTS, M.Inst.C.E., F.G.S.

[Extracts from a Paper read before the British Association of Water-Works Engineers, with a Summary of the Discussion.]

The late Mr. Bateman was one of the first water-works engineers to use concrete as an impervious core for the central trench of reservoir embankments below the surface of the ground. Other engineers have since adopted it; but it is not yet in general use as a substitute for puddle. It is natural that engineers should wish to know the results of practical tests before replacing clay puddle in works in which failure would involve such serious consequences. Puddle has long been regarded as the only reliable material for resisting water under pressure, and in earthen embankments it is still pre-eminent; but in deep trenches, concrete is far better as an impervious refilling, affording many advantages over clay, especially in bad ground. It is also more economical from a structural point of view. Cement concrete costs three times more than puddle, bulk for bulk; but in embankment work it enables the trench to be made narrower, and thus effects a saving in time, timbering, and pumping.

Before deciding to use concrete in preference to clay puddle, it is necessary to make quite sure that the foundation of the trench will bear a uniform compressive strain throughout, otherwise cracks are likely to appear in the work subsequently. In the Pennine valleys, the variable nature of the ground is a serious drawback to the adoption of concrete dams; and, wherever possible, earthen embankments should be used. An earthen dam is equally as enduring as one made of concrete, and in the district in question has many advantages over the latter. The author, however, recommends a compromise between the two forms of dam—namely, concrete below the ground and earthwork and clay puddle above—as the trench, whether refilled with concrete or clay puddle, must be carried well into water-tight strata, both across the bottom and into the sides of the valley, in order to prevent the escape of water when the reservoir is full.

The time occupied in excavating and refilling trenches for reservoir embankments depends very much upon the nature of the geological strata met with. It is usual, therefore, to commence this section of the work as early as possible after the site has been cleared. The coarser material should be deposited at the foot of the slopes on both sides, and the finer *débris* placed as near to the trench as may be safe without adding weight to the sides or interfering with the progress of the subsequent operations. Trenches to be refilled with concrete need not be excavated wider than 6 feet, except for the shouldering to form the base of the puddle; but where the subsoil consists of alluvium likely to be influenced by the weight or thrust of the embankment, concrete is not recommended. With concrete it is essential that the walls on either side of the central core should be perfectly rigid—at least, up to the point where the puddle commences. The ends of the trench which tie into the sides of the valley may in some cases be delayed while the middle or deeper part is being refilled; but in adopting this plan, a thorough knowledge is required of the geological measures throughout the entire length of the trench.

One sump well, at least, is generally required in any trench, to collect the subsoil water, and from which to pump it to the surface. This should be made on one side of the main trench, and excavated deeper than the floor of the trench. It is also a wise precaution to provide ample sump storage to cover the risk of a breakdown of the pumps or a sudden rush of water into the trench. The best position for the sump, which is of great importance, is difficult to determine at the outset, as the amount of water to be dealt with is a matter of guesswork until the opening out of the trench is well advanced. It is desirable to first obtain some knowledge of the nature of the ground and the dip and strike of the beds, as this will be a guide to the freedom of the measures to yield water or otherwise. Surface configuration is no guide to the subterranean flow of water, which, as a rule, follows the true dip of the strata. The position for the sump having been determined and the work executed, the trench should begin at this point. The refilling of sump wells in wet trenches is anxious work, especially when there is a considerable influx of water and insufficient storage. Great care is also necessary in refilling the trench adjacent to the sump, and extra cement should be used in the mixture to make good any loss caused by the wash of the water. The filling of the trench should be kept well in advance of the sump refilling, and the latter should be done quickly and with similar material to that used in the trench. The accumulated sediment must, however, be removed in the best way possible by driving the water into one corner and quietly pressing the concrete in behind it.

For hard usage in shallow depths up to 30 feet, rotary pumps are very efficient both with clean and dirty water. The pulsometer pump is very handy for slinging, where this is required, and is efficient where there is a large and steady flow of water; but when the flow is fluctuating, or falls short of the normal capacity of the pump, constant attention is necessary. The "Bastier" and bucket pumps are unsuitable for trench work; and in any kind of force or lift pumps, where gritty water has to be dealt with, the wear and tear becomes excessive. Generally speaking, all pumps and other machinery should be designed and made so as to last several years' working day and night. Old or second-hand machinery is seldom profitable; and hiring should always be avoided. Where pumps are not duplicated, they should be of ample capacity; for it is both annoying and dangerous to have the trench flooded and work stopped from time to time.

Care should be taken to prepare geological sections of the strata in the trenches and such other parts of the work as are likely to be affected by the water in the reservoir. The strike and dip of the beds should be carefully noted, also the position and the hade of faults and springs, with any other physical features revealed as the ground is opened out. Such information may prove most valuable for future reference after the works are completed, and at a time when it could not be otherwise obtained, except at great cost. The sections need not be finished while the work is proceeding; but rough notes should be plotted with pen and ink, and finished drawings made subsequently. In order to keep a continuous record of the work, "progress sections" should be taken monthly of the trenches as the sinking and refilling are proceeded with. For easy reference and comparison, distinguishing colours and dates should be put upon the plan when the progress is recorded. When completed, they form very interesting records of work done from month to month and year by year.

The sides of the trenches should be close-timbered from top to bottom in loose ground and "half-timbered" in rock, unless the beds are specially massive and unlikely to move or slip. No risk should be run for want of timber, especially in trenches approaching 100 feet in depth, which may have to remain open two years or longer. It should be well put in at the first, as there is always a risk of the ground giving way at a distance from the sides of the opening. The weight likely to press upon the timber should be carefully estimated, and stretchers put in accordingly,

sufficiently close to prevent the walings from bulging inwards. The ends of the stretchers should be placed against strong vertical timbers laid over the walings in short lengths, such as will cover not more than two or three 11-inch planks. This system facilitates their removal as the refilling proceeds. In heavy ground the soldier pieces or uprights should not be less than 4 inches thick, to prevent the ends of the stretchers punching through them; and as the walings begin to rot at the back of the uprights after being in use some time, this should be provided against. The greatest danger, however, generally occurs some time after the refilling begins, when the bottom settings of timber are removed. The stretchers then show a tendency to drop on the weaker side, when, of course, the walings follow them, and allow the material at the back to slide inwards. The timbering of all deep trenches requires not only to be well done, but should be frequently examined.

The cost of sinking and refilling trenches varies according to their depth, the nature of the ground, their situation as regards haulage, and the relative proximity of suitable materials required for their construction. For shallow trenches puddle is undoubtedly cheaper; but in deep ones this is not the case. [The author showed four methods of sinking and refilling concrete and puddle trenches. Designs Nos. 1 and 3 were similar in section and depth; but in the latter case the floor and both sides of the trench were protected with a cradle of concrete, while the former was puddle only. Design No. 2 was that adopted in the Little Don Valley Works, now under construction for Sheffield.] For purposes of comparison, a depth of 69 feet was taken in each case, and the figures given below include timbering and all necessary material and labour of every kind except administrative charges, which would be slightly in favour of No. 2, owing to the fact that less labour was involved in this case. The cost per lineal yard of trench works out as follows: No. 1, £156 5s. 6d.; No. 2, £117 12s. 11d.; and No. 3, £170 13s. 6d. No charge for pumping is included, as this item is covered by the reduced width of the upper part of the trench adjacent to the ends of the embankment in the hill sides. In the above estimates, 5 to 1 cement concrete is taken, and all prices are based on works executed in the Little Don Valley. If hydraulic lime were used in lieu of cement, the cost of the concrete would, of course, be much reduced.

Where springs exist, concrete has a decided advantage over clay. The water in a trench is sure to escape along the line of least resistance, and it should therefore be allowed to rise in short vertical pipes about 2 feet above the floor, until a sufficient body of concrete has been placed in position and allowed to set, when the pipes may be grouted up with liquid cement under pressure, and buried in the mass of concrete. This procedure cannot be adopted where clay is used, as puddle is not permanently at rest until the water required to soak it has been pressed out. The settlement which takes place during the time the material is acquiring its natural condition of repose would push aside any such temporary obstruction as an unprotected pipe over a spring. The hydrostatic head of subterranean water must be relieved or kept down until the concrete is in such a condition as to more than counterbalance the upward pressure; and it will be clear that the more impervious the matrix is the more likelihood is there that the water will cause trouble. Work of this kind should never, therefore, be left in charge of inexperienced engineers or careless inspectors. When, however, subterranean water is held back in the manner indicated, the geological measures are more likely to resist the additional hydrostatic pressure put upon them by the water in the reservoir when filled.

In deep trenches, especially those sunk in hard shale, the floor sometimes lifts in the centre; and at the first sign of this it is important to get a few feet of the refilling material in place before the "creeping" becomes serious. The first layer of the filling should be placed as deep as possible, and pressed in position; shovelling in thin layers being inadvisable, especially in wet ground. With this object in view, it is better to lower the concrete in skips; and if it is placed in position at once, and is mixed reasonably sloppy at the surface, it requires no punning. To make it close or fine, too much rather than too little water should be added; and plenty of sand should be used. Any excess of water finds its way to the surface after it has been placed in position for a short time, and a free use of sand ensures a close concrete. The author does not recommend the placing of concrete walls in front of the puddle on the inner side of the trench, as they are liable, under great hydrostatic pressure, to be forced into the puddle, especially if the clay be over-watered in tempering; and the more impervious the matrix, the more likely is this action to take place.

The importance of thoroughly mixing concrete cannot be overestimated. It requires to be worked into a jelly-like consistency, and such that no raw cement or sand may be seen when it is ready for placing in position. Concrete should be kneaded into a fairly sloppy matrix before it leaves the stage, and an inspector who will see to this being done is worth more than any specification, however long or carefully worded. The following points should also be attended to: The mixing-stages should be boarded off to prevent the wind blowing away the cement while it is being turned dry. It is a good plan to pour water upon the broken stone and sand before the cement is added, as this causes the various ingredients to mix better; the cement adhering to the stone and sand directly it is put in, and only sufficient water to slake the cement has to be added afterwards. Concrete should not be exposed to the heat of the sun or to dry winds during the early stages of setting, as this causes cracks and disintegrations of the upper films of the matrix, due to the want of sufficient moisture during the process of crystallization.

No time should be lost in getting concrete in position after it is mixed. This is difficult in deep trenches some distance away from the mixing-stages; and, to hasten the process, vertical shoots from the surface to the bottom of the trench may be used. These should be placed within shovelling distance of each other, to avoid wheeling in the trench. The shoots require a little water poured down them after each delivery, to prevent them getting choked. By this system, no difficulty should be experienced in delivering concrete a distance of 160 feet or upwards from the mixing-stages. Thin layers should not be placed on a wet foundation, but in a mass about 2 feet thick, pressed quietly home, so as to force the water slowly before it. This plan prevents the cement from being washed away by the influx of water. It is a good plan to lay the concrete in the trench in alternate layers, first on one side of the centre line and then on the other; each layer being 18 inches thick, and standing 9 inches above and 9 inches below the adjacent layer. The line of continuity is thus shortened, and the water can be diverted to the side of the antecedent layer, which will then have had time to set before the following layer is put in place. On the removal of the timbering, great care should be taken to clean, rough, and grout the face of the trench before proceeding with the refilling, and to prevent wet droppers from the sides from falling upon new concrete, which should not be trampled upon or subjected to any injury while setting.

In the author's opinion, cement is superior to hydraulic lime for concrete which has to bear compression or tension; but for making an impervious core in trenches below the ground, lime is as good a cementitious material as cement. In the proportion of 4 to 1, lime makes a richer concrete than cement at 5 to 1; it also mixes better, and is longer in setting, which is an advantage in work exposed to the sun and dry winds, though perhaps a drawback when the ground is wet. For masonry dams, the author agrees with Mr. Deacon in advocating lime in preference to cement. The following calculations will show how the two materials compare as regards cost: Taking cement at 42s. and lime at 21s. per ton, the former weighing 85 lbs. and the latter 63 lbs. per cubic foot (figures based upon the author's own experiments), the cost per cubic yard will be 43s. for cement and 16s. for hydraulic lime. The weight per cubic foot should always be specified, or the tenders that are received may prove to be very misleading.

Dealing, now, with concrete, and taking the prices and weights given above, the relative costs work out as follows:—

6 to 1 cement concrete	costs	7	s.	2	d.	per	cubic yard.
5 to 1 " "	"	8	7	"	"	"	
4 to 1 lime concrete	"	4	0	"	"	"	
5 to 1 " "	"	3	2	"	"	"	

In comparing prices for concrete work, it is important to notice not only the price of the cement per ton, but also the weight per cubic foot and the density. Fine-ground cement is lighter than coarse-ground, and therefore goes farther when measured in bulk; 5 to 1 cement concrete requires 5·4 cubic feet of cement, and 4 to 1 Lias lime concrete 6·75 cubic feet of lime per cubic yard of matrix. Cement costs 1s. 7½d. and Lias lime 7d. per cubic foot; but there are 26·07 cubic feet of cement and 35 cubic feet of lime in a ton of each respectively. Millstone grit rock weighs 154·5 lbs. per cubic foot (sp. gr. 2·48); and concrete made from this rock in the Little Don Valley weighs 138·30 lbs. per cubic foot (sp. gr. 2·22). Thus Lias lime concrete at 4 to 1 is certainly more fat than cement concrete at 5 to 1, as it contains 1·35 cubic feet more cementitious material per cubic yard. In dry weather, a cubic yard of broken stone, with its 5·4 cubic feet of cement added, requires 34 gallons of water to produce concrete in proper condition for laying. Both cement and lime should be carefully cooled before being used; but overexposure produces weakness and retards the setting. Cement manufacturers have not yet agreed upon a standard of fineness to which it should be ground. It is all the more important, therefore, that cement users should confine their orders to one manufacturer, in order to secure uniformity in the deliveries for any one job.

Every gas manager knows what it is to be troubled with complaints of "bad gas" from the consumers; and he also knows perfectly well that they are mostly due to neglect, generally the result of ignorance, on the part of those who apply to him for assistance. Mr. T. E. Franklin, the Engineer and Manager of the Goole Gas and Water Works, has found himself in this position; and, with the view of saving the consumers' pockets, he has prepared a neat little pamphlet containing a number of hints which, if acted upon, will enable them to obtain a more brilliant light, use less gas, and consequently have smaller gas bills. The hints are clearly expressed, and are accompanied by illustrations of burners. Mr. Franklin gives the consumers a great deal of information in a concise and compact form; and if, after acting upon it they are still dissatisfied, he will be ready to help them out of their difficulties.

REGISTER OF PATENTS.

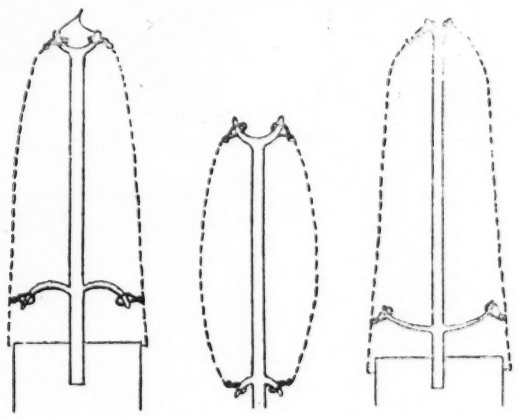
Burner for Gas-Stoves.—Clarke, E. F., of Birmingham. No. 10,005; May 2, 1903.

This invention relates particularly to burners for the Ross gas-stove—to provide a means of minutely adjusting the inlet orifice of the gas supply while the burner is alight, so that the quantity of gas escaping into the burner (whatever the pressure of the gas may be) can be regulated to suit burners of various sizes, "and thus not only ensure the advantages attained through uniformity in the production of this part, but also to provide a regulator with each burner so as to make it adjustable to suit any pressure of gas."

Incandescent Burners and Mantles.—Anderson, D., of Westcliff-on-Sea. No. 10,499; May 8, 1903.

The object of this invention relating to incandescent gas-burners is to provide improved compact and efficient means for preventing damage to the mantle by vibration or shock, in place of the various devices that have been proposed for the purpose—such as mounting the body of the burner on resilient connections or springs. Further, the patentee points out that mantles as at present made are liable to quickly break away, especially at the lower or unsupported end.

According to the first part of the present invention (which need not be more particularly referred to), the mantle-supporting rod is connected to the burner by a resilient or spring connection, so as to have movement in regard to the burner or support, the vibrations of which will be absorbed or deadened by the resilient connections, while the general appearance of the burner remains unaltered; or existing burners may be modified to embody the invention.



According to the second part of the invention, it is proposed to form the mantles with a strengthened part at both ends, and contracted at both ends (or one end only); and the mantle-supporting rod or part is fitted with supporting plates, arms, or forks adapted to engage and support the mantle at both ends, or to support the mantle at one end and so engage or hold it as to prevent lateral play at the other.

The first arrangement shows the mantle contracted and strengthened by an extra cord or thickness of matertal at both ends, but being preferably contracted less at one end than the other, for convenience in passing it over the upper end of the supporting rod, which is fitted at each end with projecting arms, having forked ends or not as desired. Loops are formed on the strengthened parts of the mantle and passed over the arms so as to prevent lateral movement of the mantle at its base. If it is required to employ such a mantle on an inverted burner, the loops and arms at the burner end of the rod can be used as suspending loops and arms. The modifications show a mantle contracted at both ends, and a mantle-rod with the arms in a position the reverse to that shown in the first arrangement.

Producing Mixtures of Gas and Air.—Lake, H. H.; a communication from the Selas Gesellschaft m.b.H., of Berlin. No. 11,827; May 23, 1903.

Concerning this invention (relating to a method of, and apparatus for, the manufacture of mixtures of gas, more especially of air and gas, for illuminating purposes), the patentee remarks that the mixture of air and gas is produced by means of one apparatus, and the mixture is placed under pressure by a second apparatus. The operation of the appliance for producing the mixture, and the operation of the suction and forcing appliance, are each regulated by a special device. There are, therefore, two separate devices required for regulating the operation—one of them throwing the suction and forcing device into and out of gear, and the other the mixing apparatus. The production of the mixture of gas and air also takes place by means of an injector under the influence of the pressure of the gas supply.

The invention is based upon the fact that it is advantageous that the mixture of gas and air should be produced wholly or mainly under the influence of the gas pressure of the gas-supply main, so that the mixture of gas and air is formed in a similar manner as in the Welsbach burner, automatically under the influence of the pressure of the gas supply. The mixture of gas and air thus produced is then supplied to the pump or suction and forcing device. By the employment of the injector-like mixing appliance, the gas and air are mixed in constant quantitative proportions. The dimensions of the mixing-nozzle constitutes the measure of the mixing proportions, as the quantity of the air sucked in by the gas is approximately proportionate to the pressure of the gas.

In order to produce a constant mixing proportion, it is important that the air drawn in and the gas should be able to flow into a chamber in which a pressure obtains which is lower than the pressure in the gas-supply main. The suction and forcing device which supplies the mixture to the pressure reservoir is connected with this chamber, which is at a low pressure, or even without pressure. The chamber at low pressure or without pressure, which is interposed between the mixing-apparatus and the suction and forcing apparatus, consists of a short conduit, if care be had that the suction and forcing device invariably deals with as large a quantity of the gas and air mixture as is produced by the mixing-apparatus. In this case, obviously, the efficiency or capacity of the mixing-apparatus and of the suction and forcing apparatus must be equal. The chamber at low pressure, or without pressure, may likewise be constituted by a special extensible reservoir, which first of all receives the mixture produced and then permits it to pass to the pump or the like.

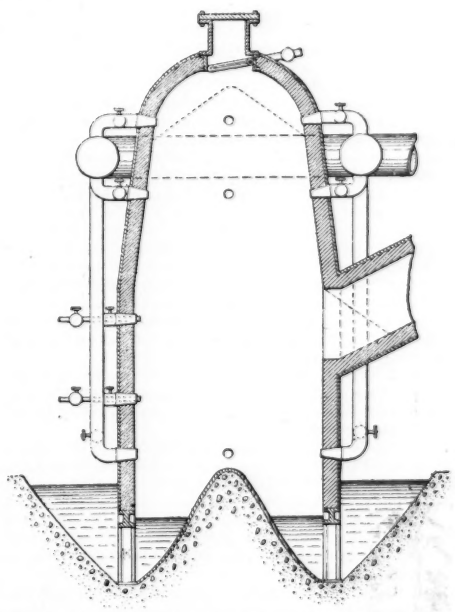
It is important that no back action of the suction and forcing device upon the injector mixing-apparatus should be possible, and that the processes of mixing and pressure producing should be to a certain extent independent one of the other. It is immaterial whether the injector mixing apparatus acts by suction or compression. Although it is possible to use any convenient form of suction and forcing apparatus, such, for example, as piston pumps, it is said to be more advantageous to use a rotary suction and forcing device of an ordinary kind—such as a fan, as by this means the necessity for employing positively or automatically operated valves for the suction and forcing apparatus is overcome.

Gas-Washers.—Imray, O.; a communication from Friedrich Burgemeister, of Celle, Germany. No. 15,060; July 7, 1903.

This apparatus was described and illustrated in the "JOURNAL" for Oct. 13, 1903, p. 102. It is a washer with plates for spraying the purifying liquid, wherin the liquid flowing into the apparatus through a small nozzle is made to fall upon convex plates or rings arranged at such distances below the nozzle and below each other, that "a very fine and complete spraying of the liquid is effected by consecutive spraying operations, whereby an intimate contact between the liquid and the gas is effected, and, in consequence of the comparatively small quantity of liquid employed, this becomes considerably enriched with the substances separated from the gas."

Process for Making Gas.—Kent, W., of New York City. No. 15,645; July 15, 1903.

The object of this invention (in the words of the patentee) is "to produce a heating gas from bituminous coal or other fuel, which shall be free from condensable tarry vapours and from hydrocarbon gases, and which will, therefore, be suitable for use in gas-engines or in furnaces in which it is desirable to have a clear smokeless flame." It is well known, he remarks, that producer gas made from bituminous coal in any of the ordinary forms of producers, is heavily charged with tarry vapours, which are apt to condense in the pipes and ports leading to the cylinders of engines; and it is therefore unsuitable for use. Gas so made also contains a large percentage of hydrocarbon gases, which are apt to give a smoky flame when burnt with an insufficient supply of air.



In order to make a gas in any of the ordinary forms of producers which shall be free from tarry vapours and from hydrocarbon gas, it is necessary, according to him, that the fuel be either anthracite coal or coke, containing no bituminous matter; and in the process described, "all the bituminous or hydrogenous part of the fuel is first thoroughly burned into carbon dioxide and water vapour, and these are afterwards decomposed by passing them through a mass of incandescent coke, forming carbon monoxide and hydrogen."

The process (carried out in apparatus of the construction shown) consists in blasting a charge of coal to incandescence, then feeding a fresh supply of coal upon the charge and blowing air directly into the charge itself at points substantially at the top and bottom, and at the

same time feeding steam or water into the charge at or near the zone of greatest temperature, and withdrawing the gas produced substantially at a point midway of the charge.

Before starting the production of gas, a supply of coke is charged into the producer, and, by means of fire and a blast of air applied at the bottom, brought into a highly heated state. The producer being in this manner nearly filled with incandescent coke, the operation of gas making is begun and continued regularly as follows: A fresh supply of coal is delivered from the hopper at the top; being heated by the hot coke lying below, and being impinged upon by a blast of air under considerable pressure from the upper series of tuyeres. It rapidly distills off its volatile matter, which is immediately burned by the excessive supply of air, forming carbon dioxide gas and superheated steam. These pass downward through the underlying mass of coke, which is kept in a state of incandescence by the burning of a portion of it by air admitted from other tuyeres, and is decomposed by the hot coke, forming carbon monoxide gas and hydrogen. The carbon dioxide, formed by the burning of a portion of the coke, is also decomposed by passing through the body of coke, forming additional carbon monoxide. The gases thus formed, together with the nitrogen obtained from the air, escape into the exit flue, which is preferably located at about the middle of the shaft. The coke in the bottom portion of the producer is completely burned by air admitted through the tuyeres near the bottom, and the carbon dioxide thus formed, passing through the superjacent mass of hot coke, is also converted into carbon monoxide, which finds its way to the exit flue.

Manufacture of Metallic Alloys having Pyrophoric Action, and their Application to the Purposes of Ignition and Illumination.—Auer von Welsbach, C. F., of Vienna. No. 16,853; July 31, 1903.

Any invention with which the name of Welsbach is connected is bound to be regarded as a matter of interest to gas people, and so no excuse is needed for the reproduction, nearly in its entirety, of the specification of this patent, though it is somewhat outside the range of subjects ordinarily dealt with in these columns of the "JOURNAL."

It has been variously asserted, says the patentee, that the rare earth metals have the property of giving off particles that are self-igniting in the air, when scratched with a hard, sharp substance. Experiments made in this direction show, however, that these statements are erroneous, as Dr. von Welsbach has found that the pure earth metals do not show this peculiar property, and that the non-ignition of the detached particles under certain circumstances rather indicate the purity of the earth metal.

He has, however, discovered that the rare earth metals become pyrophoric if they are alloyed with other metals—in particular iron. Already with a very small percentage of iron the alloy gives off sparks on being rubbed with a file; and as the content of iron is increased, the sparking becomes more intense, and eventually results in a very luminous development of light. With a content of about 30 per cent. of iron, the alloy attains its maximum of pyrophoric energy. It is in this condition so sensitive that it only requires to be slightly touched with a file to give off intense sparks. On increasing the percentage of iron, the pyrophorous action of the alloys gradually decreases; but it is still clearly perceptible with a content of 75 per cent. of iron.

It is noteworthy that the rare earth metals can apparently be alloyed with iron in all proportions. While the alloys with small content of iron do not differ (or only slightly so) as regards their chemical and physical conditions, from the pure rare earth metals, those with a relatively high percentage show quite different properties. Thus, for example, an alloy composed of a rare earth metal and 30 per cent. of iron is almost completely impervious to the action of the atmosphere, hard and brittle, and can be readily worked with a file without clogging it. The alloy, therefore, does not show the characteristic property of the more or less pure rare earth metals.

In these alloys the iron can be partially replaced by nickel, cobalt, or manganese, without materially altering the properties described. If, however, the iron be entirely replaced by these, the pyrophoric property is materially diminished. It is also to be noted that a not inconsiderable addition to the alloy of certain other elements—for example, silicon—does not materially interfere with its properties.

The patentee has, furthermore, discovered that the exceedingly small particles separated already, by slight friction (the burning of which, in the presence of air, takes place with great rapidity), are capable of igniting, with certainty and almost instantaneously, combustible gases and other easily ignitable bodies—such, for example, as a fuze or a wick soaked with spirits.

On a more energetic treatment of the alloy—such as on filing off larger fragments—intensely luminous flames, apparently as large as the hand, are, he says, produced, which are curiously devoid of heat, and do not give off smoke.

It will be readily seen from what has been stated that the production of luminous sparks and flames can be readily made practically available by means of simple appliances for the purposes of ignition and illumination for various technical purposes. Thus, for example, if the sparks are produced in the focus of a concave reflector, they will—on account of their instantaneous production and extinction—serve as flash lights of great brilliancy that might be employed for lighthouses and for signalling purposes.

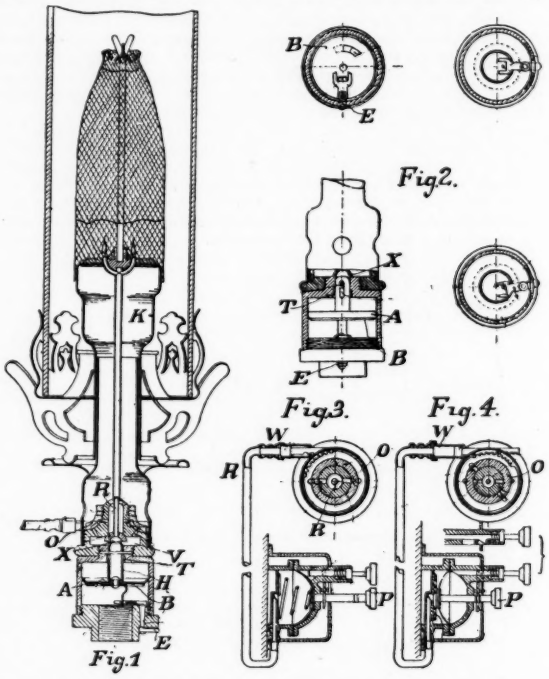
Although so far he has spoken generally of all rare earth metals as being applicable for the purposes of this invention, yet it should be mentioned, he remarks, that they vary somewhat in their action. Thus, for example, lanthanum alloys afford the most intensely illuminating effects; while the alloys of cerium afford sparks that effect the ignition of gases or substances most readily. These differences are, however, not so considerable that, in view of the high prices of some of the rare earth metals, it would for practical purposes be necessary to employ the more expensve of them in their pure condition for producing the alloys with iron. In most cases, mixtures of two or more of the rare earth metals would be employed. Thus a very suitable alloy for an effective light production might consist of about 50 per cent. of lanthanum, 30 per cent. of either neodymium, praesodymium, or cerium, alloyed with 20 per cent. of iron; while an alloy of 60 per cent. of cerium, 10 per cent. of other rare earth metals, and 30 per cent. of iron will serve excellently for spark production for igniting purposes.

The manufacture of these alloys is easily effected if the rare earth metals, after being melted down, have added to them, under exclusion of air, the requisite percentage of iron in a finely-divided condition—such as in the form of bundles of thin wire, under continual stirring. The iron easily melts under these conditions, and mixes with the earth metals. For rendering the alloy perfectly homogeneous, the mass is heated to a white heat, and is then run into moulds.

Incandescence Gas-Burners.—Stickdorn, R., of Bonn-on-the-Rhine, Germany. No. 3921; Feb. 16, 1904.

This invention relates to: (1) A device for regulating the admission of gas to incandescence gas-burners, and (2) a device for cutting off or admitting the gas feeding the lighting or main flame in burners provided with a pilot flame.

A longitudinal section of the burner is given, and several details.



The regulating valve consists of a sleeve provided with lateral openings or slots, and connected with a disc movable in a cylindrical compartment. The sleeve is lifted and lowered in accordance with the gas pressure allowing more or less gas to enter the bore of the body, whereby the slots are more or less covered and closed.

Underneath the disc A, connected with the slotted sleeve H, capable of sliding in the bore T, there is arranged a second disc B—each provided with an opening. The disc B is pivoted to the disc A, and the gas passes more quickly or more slowly, according as the apertures in the discs cover each other or are more or less out of line. In order that the passage of gas may be adjusted from outside, a lever E is adapted to turn the disc B by means of an axle and bifurcated arm. If the lever is turned, either the one or the other of the halves of the fork imparts motion to the disc. Provision is made for automatically replacing the fork in its starting position after the adjustment; and for turning the fork back to its mid-position, a spring or weight may be used. In the example shown, two coiled springs are employed for the purpose, which press equally against the lever E and tend to retain it in the mid-position.

For the igniting or pilot flame, a thin tube R is mounted in the axis of the burner; while the gas for the lighting or main flame is conducted by canals contained in a revoluble mantle O and the stationary body I, so that, by turning the mantle, the passage of gas may be stopped or opened.

The gas flows through the lateral openings in the hood X into the chamber V, and escapes therefrom, if the mantle O is in the required position, and from the mantle into the chamber, in the roof of which discharge openings are provided. If the mantle is so turned by a pin or a rack that the openings will not communicate (see fig. 4) the escape of gas is stopped.

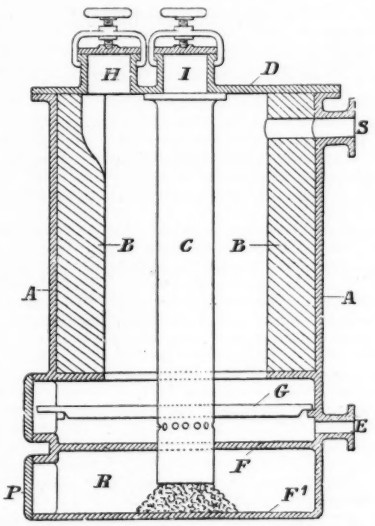
The tube R, mounted in the middle of the body I and serving to feed the pilot flame, is connected at the bottom with the hood X, and is not influenced by the turning of the mantle O, so that always the same quantity of gas escapes. The tube R is joined at the top to the tube provided with the burner-nozzles and connected with the detachable sleeve K.

In order to effect the ignition and extinction of the lamp from distant localities, provision has been made that the mantle O can be turned in one direction by air pressure, and in the opposite direction by suction. The turning is effected by a piston enclosed in a cylinder W, which acts on the body O by means of a toothed rack or a connecting rod. The cylinder is connected by a tube or hose with a device for producing air pressure or a vacuum, according to requirement. This device may also consist of a piston and cylinder, or, as shown, of a casing and flexible diaphragm. If pressure is applied to a button P, connected with the diaphragm by a rod, the diaphragm is pressed against the bottom of the casing by increasing the pressure of the spring, and the

air is pressed through the conduit so as to act on the piston, which turns the movable body O in such a manner that the gas may flow through the orifices and then be ignited by the pilot flame. The button, which has been pressed down, is held by a catch or pawl. If the latter is released, the spring presses the diaphragm back, in consequence of which a suction of air and the opposite motion of the piston and mantle take place, whereby the canals are closed and the flame is extinguished.

Producing Poor Gas free from Tarry Matters.—Boutillier, L., of Paris. No. 7979; April 6, 1904. Date claimed under International Convention, April 7, 1903.

The patentee claims the construction of a producer for making poor gas free from tarry matters in a central cylinder or vertical retort into which the coal is introduced to be distilled, and the volatile products of which themselves pass under the grate of the furnace in order to be burned; the coal which falls from the cylinder being then collected in order to be burnt in the furnace and serve for making the gas.



The producer, as shown, is composed of a cylindrical metal body A closed by a bottom F and a double bottom F^1 at some distance away; the space comprised between the two bottom plates forming a reservoir R for the coal freed from tar. A door P hermetically closes this receptacle. Above the receptacle R there is the furnace proper, comprising a grate G, surmounted by a cylindrical fire-clay part B, which extends to the top of the cylinder. A door at the base of the furnace serves for discharging the ashes. At the upper part, the cylinder is closed by a cover D having an aperture H for the admission of the coal. The gas is discharged at S. Beneath the furnace, under the grate, there is an air and steam admission at E.

The peculiarity of the arrangement consists in a cylinder C of smaller diameter than the internal diameter of the furnace, and passing through the latter from top to bottom, ending at the top (outside the producer) in the form of a tube I closed by a cap pressed on by a yoke and a screw. This cylinder discharges below into the coal receptacle R; while apertures bored in the wall of the tube are provided a little below the grate.

The coal containing tarry matters is charged in by the hopper I; and the furnace being lighted, the volatile products contained in the coal are given off and pass under the furnace through the apertures and assist in the production of poor gas. The coal freed from the volatile products is collected in the receptacle R, and it can without danger be passed into the furnace.

APPLICATIONS FOR LETTERS PATENT.

13,316.—Everitt, W., "Extracting tar and other impurities from gas." June 13.
13,320.—Belliss and Morcom, Ltd., and Jude, A., "Gas-turbines." June 13.
13,367.—Payens, L. A., and Neuman, F., "Gas-generators." June 13.
13,377.—Roux, X., Gonin, B. W., and Thompson, W., "Purification of gas." June 13.
13,409.—Bell, J. F., and Masters, R., "Flues of retort-settings." June 14.
13,439.—Tattersall, H., "Regulator burners." June 14.
13,488.—Wolff, L., "Incandescent gas-light." June 14.
13,494-5.—Chorlton, A. E. L., "Internal combustion engines." June 15.
13,500.—Hough, T., "Burners." June 15.
13,517.—Dunlop, J., and Kynoch, Ltd., "Gas-producer." June 15.
13,557.—Metropolitan Gas-Meters, Ltd., and Forster, J. D., "Prepayment meters." June 15.
13,563.—Linden, G. Z., "Gas-generators." June 15.
13,615.—Hayes, J., sen. & jun., "Wet meters." June 16.
13,647.—Woods, J. E. T., "Mantles." June 16.
13,668.—Goodridge, R. H., "Incandescent lighting." June 16.
13,670.—Scott-Snell, C., and The Scott-Snell Phillips Syndicate, Ltd., "Incandescent lighting." June 16.
13,772.—Witzel, A., "Incandescent burners." June 17.
13,781.—Alexander, C. J., "Incandescent burners." June 17.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Working of the De Brouwer Projector.

Sir,—Will you kindly allow me a little space in the "Journal" to answer a question put by my friend, Mr. Helps, of Croydon, in the discussion that followed the paper read by Mr. Ferguson Bell at the recent meeting of the Institution of Gas Engineers, on "Charging and Discharging Machinery at Derby"? I might perhaps have sent my answer direct to Mr. Helps; but, as it may interest others of your readers, I beg you to kindly allow me to make use of the pages of the "Journal."

The question I refer to was about the advisability or necessity of varying the speed of the projector during the operation of charging the retorts. Mr. Helps's memory served him quite accurately as regards his visit to Bruges. At that time, we made no use of any variation of speed, or of any alteration of direction of the coal jet; but he will also remember that when he paid us his visit, we were only working retorts 10 feet long, or (say) single retorts. The charging of through retorts of 20 feet length altered somewhat the conditions of the problem; and we found it necessary to accelerate the motion of the projector some 10 per cent., in order that the flow of coal might reach the far end of the retort, and make the layer of coal the same even thickness as we used formerly to get in our 10 feet retorts. In consequence of thus increasing the speed to charge the far end of the retort, it became necessary to slow-down the speed of the projector, to keep the layer of the same thickness at the near end of the retort. The projector is made to run at 2200 feet per minute at the beginning of the charge—slowing down to about 1900 feet per minute at the end.

The slowing-down can be quite easily done automatically; but I prefer to do it by hand—operating directly on the electric controller, which is so constructed that each division of the resistances corresponds to about 50 feet difference in the speed of the projector belt. In fact, I see no objection to this part of the work being left under the control of the stoker's mind and hand.

Might I be allowed further to say that it is just because I do not see that this kind of workmen are likely to change their minds within the short time the operation lasts, that I find no objection to entrusting it to them? On the contrary, I find that in a general way they like to do their work as they are taught, and take a pride in regulating the speed so as to put in the most perfect charges.

Bruges, June 18, 1904. J. De Brouwer.

Mr. Cranfield's Presidential Address.

Sir,—On perusal of the Technical Press, and after a study of editorial comments, presidential addresses, &c., it becomes very evident that the gas industry is waking up to the great importance of providing a more adequate and a more efficient system of training for its younger members.

The "Juniors" of the Manchester district have been successful in the organization of their Association. The results have fully justified the venture, and have supplied ample proof of the need for such an organization. We have now similar Associations in London, Yorkshire, and Scotland—all of which appear to be progressing favourably. This is surely an indication that the "Juniors" of the gas industry are anxious to widen their knowledge, and to better qualify themselves, by a close study of every phase of modern methods in the manufacture of gas, for their present positions, and also for higher positions, as opportunity affords. This is bound to enhance the value of their services, and must be beneficial to the industry as a whole.

This is now evidently recognized by many engineers; and it is decidedly encouraging to notice that they are now extending their hearty support and co-operation in furtherance of the objects in view. But something more is still needed. This is well brought out by Mr. Cranfield, in his very able Presidential Address, delivered recently before the members of the Yorkshire Junior Association. The address is highly suggestive, and ought to receive the serious consideration of all those who are interested in the future welfare of the industry.

I quite agree with Mr. Cranfield that the City and Guilds Examinations have served a useful purpose in prompting students to a closer study of gas manufacture and its allied subjects; but I consider that the examinations could be made much more satisfactory and useful by re-modelling the syllabus. Chemistry and engineering are two essential but distinct sections of gas manufacture; and the successful gas manager should have a thorough knowledge of each section. The syllabus, as at present constituted, is only a test of the general knowledge of the student, and it is impossible to treat the whole of the subject in two examinations of four hours each.

I am still of opinion that the division of the subject that I advocated in a paper read before the Manchester Junior Association in 1900, would be a more thorough test of the students' abilities. I suggested that the subject be divided into two sections—viz.: (1) The Chemistry of Gas Manufacture; (2) Gas Engineering. The chemical section would embrace the actual process of gas manufacture and distribution; also all chemical tests employed on a gas-works. The engineering section would include all constructional work of gas apparatus and distributory plant. There would an "Ordinary" and an "Honours" grade in each section. The "Honours" examination could be carried out on the lines suggested by Mr. Cranfield.

This, I consider, would be a distinct advantage over the present system, and would greatly enhance the value of the certificates. If the Institution of Gas Engineers could secure some such revision, I feel sure that it would greatly increase the value of the City and Guilds Examinations.

Mr. Cranfield's suggestion, *re* the establishment of central laboratories, is a very valuable one; and it is to be earnestly hoped that it will

receive due consideration by the authorities of the various Associations. I feel sure that an organized appeal to all gas authorities, as suggested by Mr. Townsend in his letter of the 14th inst., would meet with a liberal response.

S. E. HALLIWELL.

Littleborough, June 24, 1904.

Flow of Gas in Mains and Distribution at High Pressure.

SIR,—It would be interesting if Mr. Trewby would kindly explain his statement in your last issue, in relation to his contention as to the effect of "boosting" gas.

It is difficult to see how one section of a 48-inch main, feeding a "booster" at 5 inches pressure, can keep the other section of the 48-inch main at 30 inches pressure, unless either an additional stream of gas is injected at the inlet of the "booster," or the outlets on the main itself are so restricted—by partially closing the valves on the inlets to the gasholders, &c.—that the volume of gas thus passed would only equal that which would be delivered without the "booster" at the lower pressure, *minus* the restricted outlets.

INQUIRER.

June 22, 1904.

Mr. H. E. Jones and the Nanterre Gas-Works Installation.

SIR,—Even an ex-President must have some rest; and though I shall have plenty to say presently, *re* "Contractor-Engineering," I must ask your readers to be content for the moment with the short reminder that "no man can serve two masters." Businesslike shareholders and directors take care he doesn't get the chance.

As to Nanterre. On my short casual visit, I was told that the retorts were by a French firm. M. L'Homme's troubles are amusingly described by Mr. Marshall. The desperate resource of recarbonizing a large percentage of breeze, after trying an equally desperate remedy of watering the coals, was clearly the invention born of dire necessity. It may soon be patented by some contractor. Had it not been exalted to the dignity of an "advance in science" I should have said nothing about it.

Mr. Graham is a stranger to me. I know of none of his works, as I do not read advertisements. If he fits a cap from my address, he is welcome to it. No gas engineer will complain of it.

H. E. JONES.

June 25, 1904.

SIR,—As I did not make it quite clear with reference to M. Derval's position as sub-contractor, in the contract referred to in my last letter with the Compagnie L'Union des Gaz, of London, I now give an extract from the same:—

> "*Article No. 7.*—It is understood that, in accordance with the suggestion made by the contractors, and their letters of June 14 and 17, 1902, the brickwork of the retort-house bench, and chimneys, will be entrusted to the firm of Monsieur E. Derval, Rue Chauchat, Paris, so that the labour employed may be French, as also the design of the retort-house. Notwithstanding this, however, as previously stated, and as affirmed in the contractors' (Messrs. Graham, Morton, and Co., Limited) letters, referred to above, their responsibility for the complete success of the whole of the work remains absolutely unimpaired, and not altered in any way whatsoever."
>
> "*Article No. 17.*—As mentioned in Article 7, Monsieur E. Derval has to undertake the brickwork comprised in the retort-bench, though the firm of Graham, Morton, and Co., as the contractors, remain responsible to the Gas Company for the success of the installation."

The sub-contractors' specification between Messrs. Graham, Morton, and Co., Limited, and M. Derval was exactly the same as the specification between the Compagnie L'Union des Gaz and ourselves (as the original contractors).

MAURICE GRAHAM,
for GRAHAM, MORTON, AND CO., LIMITED.

Leeds, June 24, 1904.

SIR,—Notwithstanding the desire I feel to refrain from taking part in a controversy, and the reserve which is imposed upon me by my commercial relations, it is impossible for me to ignore the question raised by Mr. H. E. Jones at the meeting of the Institution of Gas Engineers; Mr. Maurice Graham having informed me of it in a letter which has been published by one of your English colleagues. I therefore ask you to be good enough to reproduce the following arguments which I have addressed to him, and which answer the observations of the President of the Institution so far as they concern me. Instead of replying in a humorous style, which would be very easy, I prefer to do so seriously, and to profit by the opportunity which presents itself to make a clear and definite statement on the subject.

First of all, let me say that I have no preference either for inclined retorts or for horizontal retorts charged mechanically. I construct both systems of settings at the request of customers; and I believe they are capable, according to circumstances, of rendering the very best service.

To come, however, to the Nanterre works, the retort settings at which are now in question, I constructed for the Compagnie l'Union des Gaz, at the request of Messrs. Graham, Morton, and Co., who had the general contract, a bench of eight settings of nine inclined retorts 6 m. 10 c. in length. These settings were started at the beginning of the present year, and I can state most emphatically that at no time has the heating been defective. Early in April, owing to a change in the character of the coal, slippings occurred during the process of distillation; and the coal falling towards the bottom of the retort interfered with the effective working. After repeated trials, these slippings were checked by the addition of 5 per cent. of coke dust intimately mixed with the coal before its introduction into the retort. Since then the carbonization of the coal has been perfectly normal; and the quality of the coke, instead of being poorer, appears, on the contrary, to have been improved. At the present time, at the Nanterre works, where all the coke produced is classified, there is scarcely sufficient dust made to provide for its admixture with the coal in the proportion indicated above. It seems to me that this fact alone should put a stop to all discussion on this subject.

Before concluding, I may say that the trials made in May with these settings fulfilled the requirements of the specification, which imposed the perfect distillation of 330 kilos. of coal per retort in six hours with the use of about 13 kilos. of coke per 100 kilos. of coal carbonized (cinders and ash *not* being deducted). The Compagnie l'Union des Gaz, moreover, did not hesitate to allow their works at Nanterre to be visited by the members of the Société Technique on the occasion of their recent congress. This visit, made on the 17th inst., enables me to appeal to all my colleagues in the Société to testify to the truth of what is here stated.

E. DERVAL.

Paris, June 22, 1904.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Swindon Corporation Bill.

Bills reported: Brymbo Water Bill, Crystal Palace District Gas Bill, Gas Orders Confirmation Bills (Nos. 1 and 2), Local Government Provisional Orders (Gas) Bill, Oakengates and Dawley Joint Water Board Bill, Southend-on-Sea Gas Bill, South Shields Gas Bill.

Bills read the third time and passed: Bexhill Water and Gas Bill, Gas Orders Confirmation Bills (Nos. 2 and 3), Local Government Provisional Orders (Gas) Bill.

Bills Royal Assented: Amersham, Beaconsfield, and District Water Bill, Barnard Castle Gas Bill, Bexhill Corporation Bill, Blyth and Cowpen Gas Bill, Brixham Gas Bill, Cheshire Electricity and Power Gas Bill, Chesterfield Gas and Water Board Bill, Chippenham Gas Bill, Corbridge Gas Bill, Croydon Gas Bill, Derwent Valley Water Board Bill, Gomersal Gas Bill, Gosport Water Bill, Hampton-in-Arden Gas Bill, Huddersfield Corporation Act, 1902 (Amendment) Bill, Kirkby-in-Ashfield Urban District Gas Bill, Littlestone-on-Sea and District Water Bill, New River Company Bill, Norwich Water Bill, Ryde Gas Bill, Sheppy Gas Bill, Sutton Gas Bill, Tynemouth Gas Bill, Wellington (Somerset) Gas Bill, Whitby Gas Bill, Yorktown and Blackwater Gas Bill.

The Gas and Water Orders Confirmation Bill and the Water Orders Confirmation Bill have been referred to a Select Committee, consisting of Lord Lauderdale (Chairman), the Earl of Bradford, the Earl of Leitrim, Lord Chesham, and Lord Elphinstone; to meet on Monday, July 4.

On Monday last week, the Standing Orders were suspended in order to allow of the presentation of a petition by the Longwood Gas Company against the Electric Lighting Provisional Orders (No. 3) Bill, containing the Huddersfield Order, which is to authorize the Corporation to supply electricity within the urban district of Golcar.

Petitions against the Supply of Electricity Bill, which is to amend the Acts relating to Electric Lighting, have been presented by the Gaslight and Coke, the Commercial, and the South Metropolitan Gas Companies.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Derwent Valley Water Board Bill, Newcastle and Gateshead Water Bill.

Bills reported: Barrow-in-Furness Corporation Bill [Lords], Minehead Urban District Council Water Bill [Lords], Selby Urban District Council Bill.

Bills read the third time and passed: Barnard Castle Gas Bill [Lords], Swindon Corporation Bill, Tynemouth Gas Bill [Lords].

The Ebbw Vale Urban District Water Bill [Lords] has been referred to a Select Committee, consisting of Sir Joseph Firbank (Chairman), Mr. J. E. Barlow, Mr. Raymond-Greene, and Mr. J. Cullinan; to meet to-day.

Smethwick Gas Supply.—At the meeting of the Smethwick Town Council on Tuesday, a recommendation by the Gas Committee that a concession equal to a 5 per cent. reduction in price should be made to the prepayment meter consumers was agreed to. On the same occasion, the annual report of the Gas Department, noticed in the "JOURNAL" for the 7th inst. (p. 663), was presented and adopted.

Coventry Water Supply.—At the meeting of the Coventry Town Council on Tuesday, the Water-Works and Fire Brigade Committee presented their annual report. It showed that the receipts from water-rents amounted to £14,767, compared with £13,614 in the preceding year. The figure is the highest in the history of the undertaking. The expenses were £7621—an increase of £625. The balance of revenue is £7306, to which must be added the interest allowed by the bank, £48; making a total of £7354. The capital charges came to £3002; leaving a net profit of £4352, against an estimate of £4263. The unappropriated cash balance on the 31st of March last was £6806; and the profits for the current year are estimated at £3698. The Committee recommended that £4000 of the balance in hand should be paid into the borough fund, compared with £3000 this time last year. The report was adopted.

HOUSE OF LORDS COMMITTEE.

Thursday, June 16.

(*Before the Duke of* NORTHUMBERLAND, *the Duke of* WELLINGTON, *Lord* EMLY, *Lord* TENTERDEN, *and Lord* CRANWORTH.)

THE "BERMONDSEY CLAUSE" IN ELECTRIC LIGHTING PROVISIONAL ORDERS.

The Maidenhead Electric Order.

The first Order to come before the Committee constituted as above was one by which the Maidenhead Corporation sought power to supply certain districts outside the borough with electricity for lighting and power purposes.

Mr. BALFOUR BROWNE, K.C., and Mr. VESEY KNOX appeared for the promoters; while the only opponents—the Maidenhead Gas Company—were represented by Mr. A. M. PADDON.

Mr. BALFOUR BROWNE, in opening, said the Maidenhead Corporation obtained an Order in 1898 authorizing them to supply electricity in the borough; but the borough did not contain all the populous portions of the town. There were certain districts quite close to the borough boundary which desired a supply of electricity. The borough had laid mains and erected a generating station, and had been, for a comparatively small place, exceedingly successful; but its very success had led to a very large capital expenditure, not with a view to an immediate return of profit, but with a view to an ultimate return. Although they had in the first year of working made a slight loss of £103, this loss was nothing in comparison with what would be the result of the working in the future. The petitioners urged that if the Corporation supplied outside the borough, and made a loss, they would have to place it upon the ratepayers of Maidenhead; and the Gas Company, as a ratepayer, would have to contribute towards making good the loss sustained by their trade rival. The Committee would have to consider that in certain cases the "Bermondsey Clause" had been introduced for the protection of gas companies. This clause was entirely wrong in principle. It did not merely protect gas companies. It would have the effect of giving gas companies an absolute monopoly; and therefore he would ask the Committee not to accept it in this case, but to follow the practice of the Board of Trade, which had always been to refuse it. The Corporation would not supply outside the borough unless they could see their way to a profit; and the evidence would show that the supply outside would be most remunerative. The "Bermondsey Clause" was first inserted in a Bermondsey Order at the instance of the South Metropolitan Gas Company, for whom he (Mr. Balfour Browne) on that occasion appeared. It was urged then that if the Local Authority were to conduct a trading enterprise, they should do so on commercial lines; making up their accounts yearly so that they could see at what price they could really afford to supply, and fixing their charges accordingly. It did seem fair at first sight that a Corporation should try to make an electric lighting concern pay, because they might reduce the price of electricity so as not to pay, and, by imposing a heavy rate, take money from their rivals, the gas company, to make good the loss. No man in his senses would say that, when he had made a loss, the way to recoup himself was to increase the price. The very reverse was the case. If a loss were made, the only way to turn the corner was to reduce the price. But the clause, if income was falling, would compel an increase in price, while the Gas Company came in and sold at any figure they chose. Money borrowed for an extension of enterprise must, for a certain period, be unremunerative, and lead to a loss. The clause, if adopted, would, in this case, force an increase in price; so that instead of allowing them to carry on the undertaking in a fair business way, it would compel them to carry it on in a manner which no business man would adopt. The Woolwich Order was in the same Bill as the Bermondsey Order; and the same clause was inserted in it. In the Stoke Newington Order, of the same year, it was put in by agreement. The only other cases, with which he was acquainted, in which it had been fought, was the Warmley and Walton Bill; and there an alteration was made giving the Corporation three years instead of one to get over the initial expenditure. The Gaslight and Coke Company opposed the Willesden Bill in order to obtain the clause; and with certain modifications it was inserted. These were the only cases in which, upon opposition, the clause had been inserted. In the Ilford Bill of the present session, he was reminded, it had also been inserted in face of opposition; but that Bill had yet to pass one House. These were the precedents against him. On the other hand, the Board of Trade had always taken the view that it was not their business to put in the clause, and had refused to do so. He could, however, give three instances in which, after a fight, Parliament had adopted the same course. The first was the Beckenham Bill of last year. The principle the Committee was asked to decide was important, because it seemed that they were at the parting of the ways. If the Committee determined that the clause was reasonable, it would become a precedent for all time, as would be the case if they decided to the contrary. The case was argued before the Police and Sanitary Regulations Committee of the House of Commons, in two instances—Leyton and Swindon; and the Committee declined to adopt it.

Mr. PADDON: It was expressly stated in the Leyton case that it was not to be a precedent.

Mr. BALFOUR BROWNE said he did not know that; but at any rate it was refused. Under these circumstances, they might pair off the precedents. The strongest case was very curious. The Marylebone Borough Council had taken over the undertaking of the Marylebone Electric Supply Company; and they applied this year for a Bill to raise the money to pay for it. On the second reading of the Bill, Mr. Goddard moved that it should be an instruction to the Committee to insert the "Bermondsey Clause." One member seconded and supported the motion. All the other members who spoke were entirely against any such instruction; and Mr. Bonar Law, representing the Board of Trade, spoke against it on the ground that it was not business to try to force a trader to increase his price on a falling market. The instruction was negatived. Yet an agreement was subsequently come to between the promoters and one of the opponents—he supposed to get rid of opposition—under which a clause similar to the "Bermondsey Clause" was inserted. A Huddersfield Order was included in the present Confirmation Bill; and the Huddersfield Corporation consented to put in the clause. But in that case it did not matter, because the undertaking was very paying. This showed that clauses put in by agreement were no guide. He did not ask the Committee to modify the clause, but to reject it altogether. The object of the clause was not really to protect the gas company from unfair competition, but to put a spoke in the wheel of municipal enterprise in relation to electricity; and therefore it became a matter of supreme importance that it should be decided once for all. It might be urged that in the new area the Corporation might be compelled to supply at a loss. Luckily, however, Parliament had given protection against this. In regard to outside areas, they were not bound to supply except under certain guarantees; and they might trust a town not to supply outside unless it could see its way fairly to recoup itself. There was another consideration. If the Corporation fixed the price, under the clause, on the basis of the accounts of last year, so as to recoup themselves for their loss of £403, how could they contract with large consumers? The Corporation could not give a guarantee for longer than a year. The Corporation would be bound to say: "I cannot give you a long contract, because next year I may be bound possibly to raise the price of electricity." There was no such restriction on the Gas Company. Though the Company talked about fair competition, what they wanted was unfair competition that would be established by the operation of the "Bermondsey Clause."

On the conclusion of Counsel's speech, some conversation passed, as the result of which the Committee decided to cut out certain parishes which the Board of Trade had insisted should be included. The effect of this excision was that the opposition of the Great Western Railway to the Order was withdrawn.

Mr. *Benjamin Hobbis*, the Mayor of Maidenhead, stated that the borough had an area of 2123 acres, a population estimated now at 14,000, and an assessable value of £81,261. Before obtaining their first Electric Order in 1898, the opinion of the ratepayers was taken as to whether there should be a supply by the Corporation or by a company; and there was a large majority in favour of the Corporation supplying. At first the price was fixed at 6d. per unit for lighting and 3d. for power; and as soon as they began to supply, the applications quickly became so many that they could not deal with them. This led to an application to extend the works. Last summer the applications for new supplies did not come in as rapidly as formerly. There were a large number of consumers who occupied their houses for a short time in the summer, and it was necessary to obtain the custom of those living there all the year round. In order to do this, they reduced the charge from 6d. to 5d., with the result that they received applications for 737 lamps in one quarter, as against 834 lamps in the preceding three quarters. As soon as their works were in operation, they received applications for electricity from outside the borough—Maidenhead, Bray, Taplow, and Cookham—all of which places could be served economically from the present generating station. They were accordingly seeking to supply these outside areas. In the published accounts of the first year of working, the Corporation had endeavoured to follow the Board of Trade form; and in them, rightly or wrongly, they had not given credit for a sum earned in that year, but not collected then, of £900. The gross profit for the year was £987; but they had to pay for instalments of principal and interest, £1390; so that there was a net loss of £403. The Corporation regarded the result of the first year's working as satisfactory.

In cross-examination by Mr. PADDON, witness said that, assuming that 10 per cent. of the population took electricity, and that there was a loss on the undertaking, the loss would have to be borne by the 90 per cent. of the population; but this 90 per cent. would not represent 90 per cent. of the rateable value. A few of the inhabitants were only in the locality in summer. Witness was then taken through a number of items in the statement of accounts for the year ending March, 1903; Counsel asserting emphatically that some of the figures were absolutely absurd. He put it to the witness that if the accounts were properly made out, a total loss on the year's trading of £2000 would be shown. Witness, in reply, said that the Corporation, apart from this printed statement, had drawn up an account in proper form, which showed that their loss, as had been stated, was only £400. If by going into the outside area a further loss occurred, the ratepayers in the borough alone would have to meet it. In the future, he expected that the Corporation would not make losses; but the clause would hurt them, because it would be impossible to carry it out except on one condition. If the Gas Company incurred a loss, it would be strictly confined to the Company.

Mr. *H. R. J. Burstall*, of Messrs. Burstall and Monkhouse, said his firm designed the first installation. He spoke as to the large increase in consumption which followed the reduction in price in 1903. During the first period of last year, the undertaking worked under very unfavourable conditions. Owing to the floods, there was hardly any season, and the condensing plant was not at work. The average cost per unit during 1903 was 3·4d., and in the present year (up to May) only 1·86d. He anticipated that at the end of the year the concern would be just about square, if it did not show a slight profit. Many inquiries for electricity had come from the outside areas. The effect of the "Bermondsey Clause" in the early years of working would be absolutely fatal.

In cross-examination, witness said if he was perfectly certain the Corporation would always make a profit, he should not object to the clause; but they could not be sure of that. He did not agree that the words of the clause "as far as practicable" afforded any effective relief to its operation.

The CHAIRMAN: Are you of opinion that this "Bermondsey Clause" would prevent your entering into a contract?

Witness: That is how I read it.

Mr. BALFOUR BROWNE: Not for a year. I think I could enter into a contract at the beginning of this year for a year.

The CHAIRMAN: No longer than a year?

Mr. BALFOUR BROWNE: I think not, because if I guarantee 6d. a unit for a year, if I make a loss I have to put it up to 7d. the following year.

Mr. *Christopher Milton*, the Electrical Engineer to the Maidenhead Corporation, gave confirmatory evidence, and said that they would, without further capital expenditure, be able to supply the applications from outside areas from the existing station. The only further capital expenditure would be on mains.

This closed the case for the promoters.

Mr. PADDON, on behalf of the Maidenhead Gas Company, asked for the insertion of the "Bermondsey Clause." He differed from the other side as to its effect. What the Company through the clause said was that if a public body chose, with public money that had been entrusted to it, to trade in a direction alien to by far the greatest proportion of the interests in its community and in a way that was absolutely destructive of the interests of some of the rate-aiding elements in the community, and if, moreover, in distributing the commodity they elected to consult the smallest though richest element, in such circumstances it was only fair that they should so use the public money as not to incur a loss. Electric lighting was not a fit subject for municipal enterprise at all on account of the small number—and those the very richest—who required it. The enterprise, if carried on at all, should be carried on on the common sane commercial principles that governed other undertakings. This supply threatened the Company with direct competition. They would not object if it were general in its application; but inasmuch as it applied only to a very small element in the extended area, they did object. The Company paid £500 a year in rates; but they had no representation in regard to that payment. So that they could not concur in, or differ from, the projects of the Corporation; they could only come to Parliament. Money which the Company subscribed in rates was used against them in direct competition; but the burden became more intolerable when, in addition, the Corporation required money from them to make good the losses incurred by competing with themselves. Surely this was most unjust and inequitable. There was no comparison between municipal trading in electric light and the operations of an electrical company. If it was absolutely essential to incur loss at the outset, they would find companies incurring such loss; but they did not. Even if they did, these companies would have to stand or fall by the result of their trading. The "Bermondsey Clause" was extremely fair in its application. If the Corporation traded so as to make a profit, or even so as to make ends meet, it would not touch them. If, however, they deliberately sought to incur losses, the clause would become operative and stop them. It would not, however, force them to raise their price to an extent that was likely to destroy their business, but only to what profit-earning companies were charging over the country. If Parliament gave them a maximum of 8d., Parliament certainly intended that they should go to it before they victimized those not taking electricity. Every commercial undertaking must look ahead at the beginning of its financial year; and it was not too much to ask that the Maidenhead Corporation should show some of the prudence governing commercial undertakings. The necessity for the clause, which would only be operative as far as was reasonably practicable, was shown when the vast proportion of municipal electric lighting undertakings were being worked at a loss—a deliberate loss, because it was incurred after a number of years' experience. He was not urging that which had not commended itself to Parliament. In the precedents, Mr. Balfour Browne did not include one that was peculiarly pertinent—the case of Brighton. Brighton had the most profitable electric lighting undertaking in the whole country. It supplied five times as much electricity per head as Birmingham did. It had never made a loss, although it had been trading for many years. They came to Parliament and, almost alone in being able to say that their record was clean, and that they had never taken a farthing from the rates, they asked for authority to trade in adjoining districts. Even with such a record Parliament said that if they went into adjoining areas to trade with the ratepayers' money they must act under the "Bermondsey Clause," which was inserted. If it was necessary in the case of such an undertaking, how much more necessary was it in the case of a concern like this, which brought up a set of accounts that were a disgrace. The Corporation urged that, having failed in a rich borough, they would succeed in a sparsely populated outside area of, he was almost going to say, prairie value. It was said the gas companies were as free as air. This, however, was beside the mark, because they were under a number of the strictest limitations as to price, dividend, and so on. Above all was the crowning fact that their losses were their own, as their profits were their own—that they did not go to poor people to make up the loss sustained in trading with the rich. The poor who used candles or oil, the poor wretches who did not have light at all, had all to bear this loss. In getting their powers the Corporation proceeded by Provisional Order, because in that case they did not need to take the opinion of the ratepapers, as they would have done under the Borough Funds Act if they had promoted a Bill. The Gaslight and Coke Company had a capital of over £27,000,000; and the portion of their undertaking in the Marylebone area was infinitesimal as compared with the whole, yet Parliament gave them the protection he now sought. How much more cogent was the present application, which had relation to a concern with a bad record, and to the whole area of the Company? In the Marylebone case, provision was made that nothing should prevent the Council from entering, in certain circumstances, into contracts for more than one year. The Maidenhead Company would willingly accept this, and it would meet one of the main contentions of the promoters. He did not ask for the clause in any specific form, but in such form as the Committee might think to give it to him. If the clause was the insurmountable obstacle to the successful carrying on of the undertaking, why had it been voluntarily accepted in a number of cases? Where a municipality was honest in its purpose, and where there was no sinister object, there was no objection to the clause; and he therefore asked the Committee to accept it.

Mr. BALFOUR BROWNE said his learned friend had elected to call no evidence, and therefore he had no right of reply.

The Committee thereupon adjourned.

Friday, June 17.

The CHAIRMAN announced that they had been unable to get the full Committee, and asked whether the parties were willing to take the decision of four of the members.

Counsel on both sides having agreed to accept this,

The CHAIRMAN said the Committee would give their decision when they had done with all the four Bills referred to them.

The Committee then proceeded to deal with the

Huddersfield Corporation Order.

Mr. BALFOUR BROWNE said the Order was for the purpose of enabling the Corporation to extend the supply of electricity to Longwood. The Gas Company opposed, and asked for the insertion of the "Bermondsey Clause." The Corporation did not care whether it was in or not, because they did not believe it would do any harm, seeing that it was only in the event of loss occurring that the clause operates. Therefore they agreed with the Company in these terms: "Subject to the sanction of Parliament and the Board of Trade, and in consideration of the withdrawal of the petition of the Longwood Gas Company, we undertake to insert this clause in the Order," &c. They were quite willing to carry out the undertaking; but they understood that the Board of Trade had some objection to the insertion of the clause.

Mr. FRERE (for the Longwood Gas Company) said he understood there was some technical difficulty as to whether the Order was before the Committee or not.

The CHAIRMAN: It seems, as I understand, to be withdrawn from our jurisdiction. It is a question for the whole House. If it is considered to be against public policy, the House has to deal with it; the Committee cannot.

Mr. BALFOUR BROWNE: The only reason it can be withdrawn from your jurisdiction is that they have withdrawn their petition; otherwise it would be before you. Unopposed Provisional Orders are not dealt with by the Unopposed Committee, but by the whole House; and under these circumstances it would be impossible for us, in the whole House, to put in this clause. I do not want to take advantage of that. I want to insert the clause; and I am quite willing—notwithstanding the withdrawal of my learned friend's petition—with your Grace's permission, to allow him to appear and to agree this clause with him.

Mr. BAGGALLAY (for the Company): You see how the difficulty has arisen. We were petitioners against the Order, which would have come before your Grace in the ordinary way as one of the measures to be confirmed by the Bill before you. We ceased to be petitioners directly the clause we asked for was conceded to us by the promoters. After we had withdrawn our petition, the Board of Trade struck out the clause. We have to ask your Lordships, in dealing with this Order, to restore it. The Board of Trade have no objection to this being raised before your Lordships and discussed. I understood there would be no objection to its being raised before this Committee.

The CHAIRMAN: Counsel are asking us to do something beyond our jurisdiction. He added that it seemed to him to be one of those cases of extreme difficulty caused by the parties not coming to an agreement until the last moment.

Mr. BALFOUR BROWNE: It was agreed on Monday, two or three days ago. The difficulty has arisen by the withdrawal of the petition. If they had not withdrawn the petition, they would have been here, and then you would have heard them. It is only because they have been a little premature.

Mr. BAGGALLAY; The withdrawal of the petition was part of the agreement.

Mr. BALFOUR BROWNE; But then it might have been withdrawn in Committee.

The CHAIRMAN: We have no jurisdiction, and cannot deal with it; and the inconvenience, if it has arisen, has arisen—I am not saying which party is to blame—because the parties did not make up their minds sooner.

Mr. BAGGALLAY: Will your Lordships put the Order last in the list? This would give us time to present a petition and make the proceedings regular—give you jurisdiction.

The CHAIRMAN: What possible objection is there to raising the point in the House?

Mr. BALFOUR BROWNE: I am told, by the rules of the House, it cannot be done, because the Board of Trade are objecting to it. I think we are entirely in your Lordships' hands.

The CHAIRMAN: The House surely can do anything. If you mean to say the House will not do it, that is not my affair. You must go to the Chairman of Committees.

Mr. BAGGALLAY repeated his request that the Order should be put last in the list.

The CHAIRMAN: You can see the Chairman of Committees; and if he desires it shall be put last, I have no doubt it can be done, but you must settle it with him.

Monday, June 20.

Hampton Wick Electric Lighting Order.

The Committee had the above measure before them to-day.

Mr. FRERE, of Messrs. Rees and Frere, said the Hampton Wick and District Electric Lighting Order had been granted by the Board of Trade to the Twickenham and Teddington Electric Supply Company, Limited, to enable them to supply in various urban districts. The same question as had arisen in the other cases occurred here, but in a rather different form, owing to the insertion of a clause which authorized any local authority (with certain exceptions) within whose district any part of the area of supply was situated to purchase their portion of the undertaking within a certain period. The Hampton Court Gas Company had presented a petition against the Order, asking for the insertion of the "Bermondsey Clause," but with a proviso that the clause should only become operative if the Urban District Council of Hampton Wick exercised their right to purchase. To this, he understood there was no opposition by the Hampton Wick Council. The Committee were therefore asked to insert the clause in the Order. The clause would not affect the promoters, because it would not be operative till after they had parted with their undertaking.

Mr. PADDON, on behalf of the Hampton Court Gas Company, said he had agreed a clause with the Hampton Wick Council; and if the Committee would insert it, he would be able to retire from the case.

The CHAIRMAN said the Committee had stated that they would not make up their minds in regard to the clause until they had heard all the cases in which it was raised.

Mr. PADDON suggested that, in that case, he should address the Committee after they had heard the other cases. It was matter of agreement here.

The CHAIRMAN: Surely it is a matter of principle which affects all these different localities in the same way.

Mr. PADDON. I agree; but in this case the District Council are willing to give it.

The CHAIRMAN: As I understand, what is submitted to the Committee, practically if not technically, is the question: Is it or is it not to the public advantage that the "Bermondsey clause," or something like it, should be inserted in Orders of this description?

Mr. PADDON: That is quite true.

Sir R. LITTLER said he was in one of the cases in which the clause had been agreed; and he desired to address the Committee on the distinction between cases where the clause was agreed and where it was not.

The CHAIRMAN said he was afraid the only way would be to hear Counsel as their Orders came on. Counsel would no doubt be merciful and not repeat their arguments.

Mr. HUTCHINSON, representing the Kingston Gas Company, who supply gas in a portion of the area covered by the Hampton Wick Order, intimated the course he intended to pursue. The Committee were sitting to decide a question of general principle. He had to inflict himself upon them in the case of the Malden and Coombe Order as well as in this; and he proposed to say what he had to say on the principle in one speech. In the Hampton Wick Order, the question arose in a different way from that in which it arose in the Malden and Coombe Order. In the Hampton Wick Order, the power to purchase at the end of 42 years, as provided by the Electric Lighting Act of 1888, had been varied by the term being shortened to 35 years. Hence the "Bermondsey Clause" would operate, if inserted, only at the end of that period, and in the event of the Local Authority purchasing. He assumed that local authorities sometimes acted wisely. At the end of 35 years the undertaking might be profitable; no doubt in the hands of the Company it would be. It was only in such an event that the Local Authority could desire to purchase; and in that case where would be the objection to the clause? If the undertaking were profitable, the clause would have no detrimental effect whatever. It could not be said that the clause would throttle the concern in its initial stages, because at the time it became operative the undertaking would have passed through an initial stage of 35 years. There could be no misapprehension by the Local Authority of having to meet a loss; and it could not be urged against the Gas Company that they were selfish—that, while seeking to safeguard their position, they were endeavouring to participate in the profit revenue. If, on the other hand, during 35 years the undertaking had not become profitable, it would not be to the advantage of the community of Hampton Wick that it should be purchased, because Parliament had never contemplated that a local authority should step in and supply electricity at a loss. These remarks showed how the clause would operate in the case of Esher and the Dittons, which were covered by the Order. He would leave the question of general principle to be discussed later on.

Mr. FRERE said that finished the Hampton Wick Order.

Malden and Coombe Order.

Mr. WEDDERBURN said the next Order to be dealt with was that granted by the Board of Trade to the Urban District Council of the Maldens and Coombe, with the object of enabling the Local Authority to start an electrical undertaking. It appeared to him that these cases could be divided into six classes. There was the class of new undertaking trading in own area (as in the case of Malden); the class of old or existing undertaking in own area trading at a profit; the class of old or existing undertaking trading in own area at a loss; and then there would be three similar cases, but with the local authority seeking to go outside its own area. The two elements, one of which at least had to be present before the clause applied, were that the local authority should be supplying outside its own area or should be trading at a loss. Where, however, the local authority was establishing an absolutely new supply in its own area, there could be no ground for saddling it with this restrictive clause. The question of adding the clause did not, in this case, therefore depend on two of the chief arguments advanced in Maidenhead case. One of the arguments was that, if the local authority chose to trade outside its area (thus showing, so far as it went outside, that it ceased to be a local government authority and was purely a commercial undertaking), and if it made a loss, none of the loss would fall on the people outside, although the trading had been in respect of people outside. The other argument was that loss was of itself evidence of mismanagement. To saddle a new undertaking with this clause, which was admittedly restrictive, and, as far as he could see, was in the nature of a penal clause, seemed to be like giving a dog a bad name and hanging it. The undertaking, being a new one, the question was whether they were to be allowed to trade. This, however, was not the question before the present Committee. It had been decided by the general law and by the Board of Trade, both of which had said that they were. A great deal of the argument put forward in favour of the "Bermondsey Clause" mixed up the question of being allowed to trade with the question of whether they were to be allowed to trade only on particular terms. The precedents on each side appeared to balance. The whole question was whether, being allowed to carry the undertaking on, the local authority were to do so at a profit or at a loss. If it could be shown that the clause would help them to a profit, it was a good one. If, on the other hand, as Mr. Balfour Browne had conclusively shown, it tended more towards loss than profit, it was a bad clause. The question was purely one of business; and he deprecated the endeavour that had been made to render it a class question by suggestions as to electricity being the luxury of the rich while the poor used candles or oil.

Mr. HUTCHINSON, for the Kingston-upon-Thames Gas Company, said Mr. Wedderburn seemed to have rested his case upon a strange argument. Where did Mr. Wedderburn find that it was contemplated or implied by Act of Parliament that a local authority should, by the supply of electricity, make a profit and become a trading concern? So far as he (Mr. Hutchinson) was able to see, Parliament never intended local authorities to trade in any and every thing. They should mark the limitation which Parliament had imposed in respect of so-called trading by local authorities in various commodities. In regard to water, Parliament had said to local authorities that, unless to meet a necessity, unless there was no other body able and willing to supply, they should not become suppliers. Similarly a local authority could only supply gas in districts in which no company operated; and, while a local authority might purchase tramways, they could not trade in them. Whereas water was a prime necessity, and gas was almost in the same category, tramways were not absolutely essential. Therefore Parliament drew a marked distinction, and said that if a local authority desired to manipulate tramways for the benefit of the inhabitants of a district, they must show that such action would be to the advantage of the district and, as a first necessity, that it would be profitable. In the case of the Aberdeen and Dundee Tramways, it was provided, as a condition precedent to the Local Authority working them, that they should be made self-supporting. The supply of electricity was not a necessity of life; and just as Parliament in the case of the Dundee and Aberdeen Tramways had said the undertaking should be self-supporting, so in this instance it was in accordance with public policy that the principle, though not necessarily the words, of the "Bermondsey Clause" should be given effect to, so that the supply of electricity should be self-supporting. He did not contend that the Kingston Gas Company should not be subject to competition. Parliament had said that local authorities, subject to some restriction, might supply electrical energy in competition with gas companies; and, indeed, Parliament had even gone to the extent, under section 29 of the Electric Lighting Act of 1882, of considering that the competition in certain cases might be disastrous to gas companies, because it had provided in the section that, where a gas undertaking, in consequence of the competition of electric light, could not be carried on to the advantage of the gas undertakers, they might go to the Board of Trade and be relieved of their powers. But the existence of this section was all the more reason why the Committee should say that, in the interests of public policy, gas companies authorized by Parliament, whose capital had been embarked on the faith of the understanding with Parliament, should not be subjected to such unfair competition as would inevitably render their concerns valueless and cause them to apply to the Board of Trade to be relieved of their obligations. It seemed to strengthen the position of gas companies to say that Parliament had contemplated competition, and had made express provision in regard to the effect of it, because this was a reason why the Committee should see that the pledges of Parliament to the shareholders of gas undertakings should be faithfully regarded, and that the bargain between Parliament and the subscribers to those undertakings should be carried out faithfully on both sides. He did not ask the Committee to insert the "Bermondsey Clause" word for word, and he did not maintain that the form of words in the clause carried out in the best way the idea that municipal enterprise should be self-supporting, because he frankly confessed that he saw difficulties in the way. The first provision of the "Bermondsey Clause" said that the local authority each year should make an estimate of what their revenue and expenditure would be. Surely this was not a hardship. It was one of the most elementary principles of business. The Committee in the Leyton case said their first reason for not giving the clause was that the Local Authority already did that which the clause said they should do—viz., make an estimate of revenue and expenditure each year; and if the Committee read the proceedings in that case, they would see that the reason the second portion of the clause was not given was that the opponents who asked for it did not give evidence in regard to it. He would be prepared at a later stage to bring up a clause which would amply protect the Local Authority and enable them to launch their undertaking on a fair and satisfactory basis. It had been urged that Gas Companies were anxious to guard themselves against incurring loss, but were desirous of sharing in the profit. This was a fair argument; and the wording of the clause should provide for it. He also suggested that the clause should be altered so as to relieve the Gas Company (those whom Parliament had expressly authorized to supply a similar commodity) from contributing towards the revenue of their opponents, and at the same time give effect to the true principle—viz., that the undertaking should really be self-supporting.

Mr. WEDDERBURN, for the promoters, observed that he had no right to reply, no evidence having been called.

Tamworth and Eastleigh Orders.

Mr. WEDDERBURN, in regard to the Tamworth Order—the first one opposed in Bill No. 2—said it was in exactly the same class as the Malden Order. The Local Authority had not hitherto supplied electricity, but were now seeking to do so. The sole question was whether local authorities should be fettered. Unfair competition must depend on the conduct in the past; and obviously this argument could not be used against the Tamworth people, because they had no past in regard to the supply of electricity. He agreed that if in a particular case evidence could be brought to show that a local authority having the rates at their backs had traded recklessly in electricity, had fixed the price at a ridiculously low figure, with the object of destroying the gas company in an unfair way, there would be a strong argument for conceding the clause. But this was not the case here. At last they had the admission that the "Bermondsey Clause" was a bad one; and the question therefore was not whether the clause was to stand, but whether some clause was to stand—a clause presumably preserving freedom as to forward contracts, and far less fettering than the "Bermondsey Clause." It was said that an annual estimate was a good thing. If the clause stopped there, probably no one would object; but the vice of the clause lay in the direction as to fixing the price each year. But why was the price to be fixed each year after the first year's working. It was

admitted that one year was much too short a period to take; but how were they to fix the period? The question of what was to be the initial period in which to see whether the authority could make a profit must depend on the circumstances of each particular case; and if the Committee were to fix five years, it might be unreasonable in some instances, just as in other instances ten or fifteen years might be unreasonable. No period could be fixed as a general principle, because each case needed separate consideration. The Eastleigh Order was included in the Bill; but as the facts were identical with those of Malden—a new undertaking in its own area—he would not deal with it in detail, but simply adopt the arguments he had used in the Malden case.

Mr. NEVILLE, for the Tamworth Gaslight and Coke Company, associated himself with what Mr. Hutchinson had said in the previous Order. The fundamental position in this case had been defined by the Select Committee of the House of Commons on Municipal Trading Accounts, who reported last year that, wherever municipal trading existed, it was very important that the ratepayers should be not less fully and continuously informed of the success or failure of the undertaking than they would be if they were shareholders of an ordinary undertaking. This ought to be the position under this Order. The ratepayers, however, were not in the position of ordinary shareholders. In the first place, their sanction was entirely unnecessary to the promotion of a Provisional Order; the only persons whose consent was required being the members of the Council. The ratepayers were not consulted; and they were quite without the power to prevent an extension of municipal trading taking place. Another point had relation to the fact that companies, such as water or railway companies, which passed over or under land, were dealt with as regards rating in quite a different way from that in which municipalities were. Of recent years there had hardly been a company of this kind which had not pointed out that their trading had been largely interrupted and interfered with by the pressure of the rates. He asked for a clause similar to the "Bermondsey Clause" or the "Marylebone Clause," containing a limit of time within which the local authority could ascertain whether they could carry on their undertaking profitably. It was quite clear that many municipal electrical undertakings had been carried on at a loss; and that being so, Parliament should grant them protection at once, in case the particular municipality applying for this Order squandered the money of the ratepayers. If the municipality did not act in this way, and if they were given a proper time—say, three years—to ascertain whether they could carry on their undertaking remuneratively, surely the imposition of the clause would not adversely affect them? The Tamworth Gas Company had no objection to fair competition; but the competition in this case was not fair—the Company being rated on a different basis from that on which the Corporation were rated, and having to supply the means by which the Corporation competed with them. The Company asked for the insertion of a clause under which the sanction of the ratepayers and owners would have to be obtained before a local authority could borrow money.

Hanwell Order.

Mr. C. E. ALLEN appeared in support of the Hanwell Electric Lighting Order.

Mr. NEVILLE represented the Brentford Gas Company, in opposition; but he had nothing more to say, this case and the last being on all-fours.

Mr. ALLEN said the Order was in the same class as the Coombe and Malden and Tamworth Orders. The Local Authority were proposing a new supply in their own district. For a year or two the undertaking might not make a profit; and if the clause were put upon them, it might throttle them at the start. The petitioners asked that the Council should be put under obligation not to apply to the Local Government Board for power to borrow money in respect of the electric lighting undertaking until they had obtained the consent of the ratepayers to such expenditure. Such a public meeting as was suggested was, however, the least satisfactory form of obtaining the opinion of the ratepayers. At it there would probably be no one except the representatives of the Gas Company and several employees. Hanwell was a district which was rapidly increasing. If this clause were imposed, it might prevent the undertaking from being successful.

Watford Order.

Mr. WEDDERBURN said the next case was that of Watford, and it was one in which the Local Authority were supplying in their own area at a loss. They obtained their Provisional Order in 1897, and completed the works in 1899. In 1901, the urban district was extended; and it was in this extended area that they sought authority to supply. They had a population of 30,000 and a rateable value of £157,000. The average loss since 1889, apart from payments for sinking fund and interest, averaged £198 per annum. This case, therefore, raised the question whether or not loss was any evidence of mismanagement. Every undertaking in its initial stages must have years of struggle. In the petition it was stated that they had no objection to competition on commercial principles. If, however, this clause was consistent with commercial principles, it ought to be put upon gas companies as well as upon local authorities—upon every undertaking that came to Parliament. It was established that local authorities might trade; and that being so, they must be allowed to trade on commercial principles, and then the sole question was: Was the "Bermondsey Clause" founded upon commercial principles? He maintained that it was not, because, as they knew, no commercial body had ever proposed it. It was proposed by a competitor with a view to fettering the concern that was competing. The question really arose as to whether the clause ought not to be dealt with by the general law. The Committee were asked to put the clause into every Electric Lighting Order whatever its nature; but he would lay down the principle that it should not be put into such Orders.

Sir R. LITTLER said he did not know that anyone had asked that it should be put into every Order.

Mr. WEDDERBURN said in that case, in what different classes of Orders was it to be put? Was it to be said that it should be inserted in cases where there was a loss? If it was said that it was to go in as a rule into any general class, of course, that was general law, and should be dealt with by the general law. If it was said that it should go in in particular cases, then it would be a matter of evidence. This dilemma could not be avoided. It could not be suggested that the Watford people had mismanaged their concern. After an inquiry with regard to the granting of the Order, an Inspector of the Local Government Board held an inquiry locally with regard to the borrowing of the money; and at this inquiry the ratepayers, including the Gas Company, had ample opportunity of being heard. That the Local Government Board had full control was shown by the fact that, in the case of Eccles, the loan was twice refused.

The CHAIRMAN intimated at this point that the Committee intended to call evidence from the Board of Trade in reference to the clause.

Some conversation followed as to the course to be pursued in regard to this evidence; and ultimately it was understood that, after it had been given, one Counsel would address the Committee upon it.

Witnesses were then called in support of the Watford Order.

Mr. *H. M. Turner*, the Clerk to the Watford Urban District Council, gave details and figures as to the progress of the undertaking. The effect of the "Bermondsey Clause" would be to compel them to raise the price of electricity. The total deficiency incurred since the works were completed amounted to £4088. It was necessary, however, to consider that £4434 had been paid in respect of repayment of capital and interest; so that, but for capital expenditure, there would have been a balance in favour of the concern of over £300.

Cross-examined by Mr. PADDON: The population of the area was 35,000; and there were 335 consumers of electricity for lighting purposes. He thought the concern would soon be profitable. He objected to the "Bermondsey Clause," because, under it, there would be great difficulty in fixing the charge for electricity, and it was quite unnecessary.

Mr. *W. H. F. Colebrook*, the Resident Engineer to the promoters, also gave evidence in support of the Order.

This closed the case for the promoters.

Mr. PADDON then addressed the Committee on the petition of the Watford Gas and Coke Company, pointing out that, on the Council's own accounts, it appeared that they had been making a colossal loss for four years, totalling at least £3900. With a record such as this, it was idle for them to contend that there was no charge of bad management. If anything, this case was worse than any other he had had to refer to, because in this vast district there were only 330 consumers. The attitude of the ratepayers was shown by the fact that an attempt had been made to vend the concern to a private company. The confidence shown in that room must be singularly ill-placed if they had been taking the undertaking about trying to hawk it. If the operations of the future were to entail loss nearly as great as in the past, there was the strongest ground for the very moderate protection sought being allowed. They were selling electricity at a fanciful figure. They said that if there was a loss they should reduce the price. But if this argument were carried to its logical conclusion, they had better reduce the price to nothing at once, because then the profit would be overwhelming. When, in 1873, the Brighton Gas Company had a loss, they applied to Parliament for power to increase the price. The Company obtained power; and they tided over their period of depression and were now prosperous—thus violating the absurd principle that the way to meet a loss was to reduce the price. He asked the Committee to insert a clause, closely connected with the "Bermondsey Clause," directing that, when they came to raise further capital, they should consult their ratepayers as they would have to do if they were applying for a Bill under the Borough Funds Act.

Mr. HUTCHINSON at this point handed in the clause which he proposed should be inserted for the protection of the Kingston Gas Company in the Hampton Wick Order:

> Provided always that, in the event of that part of the undertaking which is situate within the district of the Urban District Council of Esher and the Dittons being purchased by the said Urban District Council of Esher and the Dittons (hereinafter called the District Council), in pursuance of section 2 of the Electric Lighting Act, 1888, as so amended, such District Council shall, in respect of such part of the undertaking so purchased by them, once in every year after the first year's working of such part of the undertaking, cause to be laid before them a statement and balance-sheet of the accounts of such part of the undertaking, drawn up in accordance with the form of accounts prescribed from time to time by the Board of Trade for a local authority under the Electric Lighting Acts, 1882 and 1888, and the District Council shall thereupon fix annually the charges to be made for the supply of electrical energy in the then ensuing year at such rates (not exceeding the maximum rates specified in this Order) that, so far as is reasonably practical, the revenue of that year shall not be less than the estimated charges on revenue account and of the charges for interest and sinking fund for that year; provided also that nothing in this section contained shall prevent the District Council from entering into contracts for periods exceeding one year under special circumstances with particular consumers to supply electricity at prices fixed by the contracts; provided also that there shall not be made against the general district rate of the District Council in respect of street lighting or other municipal purposes for which energy shall be employed a charge at any higher rate than that charged to consumers using energy for the like hours of supply.

Bath Order.

Mr. HUTCHINSON said he appeared in the next case on behalf of the Bath Rural District Council, in support of their Order. He would at once call evidence.

Mr. *A. J. Frippard* said it was not proposed by the Bath Rural Council to erect a generating station, but to take a supply in bulk for another authority. The Somerset and District Electric Power Company, having obtained powers to supply over a large area, would manufacture cheaply, and furnish a supply to the promoters. Other sources of supply were the Bath Corporation, and possibly the Bath Tramways Company. All the promoters would have to do would be to lay electric mains and distribute. He estimated that, after payment of interest and sinking fund charges in the first year, there would be a deficit of £63, equal to a rate of ¼d. in the pound; and in the second year there would be little or no loss. From that time onwards he anticipated that the undertaking, which would consist of nothing but distributing mains, would be remunerative.

Cross-examined by Mr. BAGGALLAY, K.C. (who, with the Hon. F. THESIGER, appeared for the Bath Gaslight and Coke Company): He

agreed that the total population of the Rural District was about 27,000, and that the population of two places, Twerton and Weston, adjoining the city of Bath, totalled about 17,000. It did not follow, however, that other districts were not valuable. There were houses elsewhere in the area which were likely to take current. If the undertaking were not successful, the rateable value throughout the district would practically have to be burdened to run the concern for the benefit of that portion of area to the west of Bath.

Mr. *Bolwell*, the Surveyor to the Bath Rural District Council, confirmed the evidence of the last witness.

This closed the case for the Order.

Mr. BAGGALLAY, on behalf of the Bath Gaslight and Coke Company, submitted that this was not a case in which the Order should be confirmed, or, if confirmed, that the "Bermondsey Clause" should be inserted. As long as the Local Authority ran the undertaking on strictly commercial lines, the Company had nothing to fear; but the great danger was that local authorities, certainly in the case of small undertakings, would not be able to run on such lines. Where was the fairness in competing with the local authority when the competitor was a large contributor, through the rates, to the support of its opponent? The Bath Gas Company's undertaking extended over a considerable portion of the area covered by the Order. It was said that the Council were going to take their energy from the Somerset and District Power Company; but there was not a single electric company, with the exception of one on the Tyne, which was supplying any energy at all. Everyone, therefore, was ignorant of the ability of power companies to supply in bulk cheaply. The Bath Corporation had also been referred to. They might or might not be able to supply, so that they could not be relied upon. Counsel went on to refer to the precedents of the Aberdeen and Dundee Tramways, and to the Ilford and Leyton cases of the present session. He asked the Committee not to confirm the Order at all, having regard to the largeness of the area, the thinness of the population, the comparatively small rateable value, and the fact that the undertaking, if carried on at all, must be carried on at the risk of the rates of the whole district for the benefit of the small populous areas close to the city of Bath. If they did confirm it, he asked the Committee to insert a proper clause for the protection of the ratepayers.

The CHAIRMAN said this concluded all the Orders; and he therefore proposed to call

Evidence from the Board of Trade.

Mr. *Pelham* said he did not appear as a witness, but only to answer questions.

The CHAIRMAN said the question which the Committee wished to put was mainly based on the statement that the Board of Trade had in no instance sanctioned the "Bermondsey Clause." The Committee thought that, following on this, he might wish to make a statement.

Mr. *Pelham* said the Committee had been told that the clause was proposed in 1902 and refused by the Board of Trade, who had always refused to insert it since. This had been in the absence of any decided instruction from Parliament. In several of the earlier cases he thought it was inserted by agreement. Of course, when a very flourishing concern making a profit came for an Order to extend its district, it did not mind putting in the clause; but the younger local authorities—those applying for the first time—naturally objected to it. Perhaps he might give the main reasons why the Board of Trade had always refused to insert the clause. The chief objection was that, as drafted, it did not appear to the Board of Trade calculated to accomplish the objects in view. The Board considered that, if a scheme showed a loss, probably the best way of rectifying that loss would be to reduce the price. Of course, it might have the effect contemplated by the gas companies, of crippling the undertaking; but it would not protect the ratepayers as a whole. Then it appeared to the Board of Trade, coming to the wording of the clause, exceedingly difficult to define what the first year's working was. These Orders were not generally put in force for some time. A site had to be obtained and a generating station erected, and the undertaking began in a very small way indeed; and it would be very difficult to know what would be the first year's working. Even after the first year, at the end of the third year there might come a time when there was an opportunity for the local authority to develop their works—possibly for some new estate which might be developed—and the undertaking might be put to very considerable expense which, although it would pay seven or eight years after they had started work, would mean a loss for two, three, or four years or more. It did seem that a local authority, like all other undertakers, must be prepared to face a loss in order that they might have an eventual gain. Their Lordships had probably been informed that the Act provided that any profit after 5 per cent. must go to the rates of the local authority; and if the ratepayers were to benefit by the profit, it did not seem unfair that they should undergo some risk of loss. It seemed also, dealing with the wording of the clause, very difficult to say what was the expense for that year. "The revenue for the year shall not be less than the expense for that year." Did that mean expense on the works, or did it mean after payment of interest and instalments for sinking fund? It was quite possible that a local authority might find themselves at the end of a year with 4 per cent. in hand, which would be a profit if it was the case of a company. It would be a profit which would go towards a dividend. But in the case of a local authority, they would have to pay 5½ or 6 per cent. for interest and sinking fund; and therefore there would be a loss that year. It also appeared to the Board of Trade that the consumers, especially for power, should not have frequent changes. It was important that a firm taking current for power should know what the price was likely to be for some years. He rather gathered, from the evidence, that there might be a saving for contracts; but if contracts at a low price were saved, it would put a most tremendous burden on the ordinary consumer. They would have to bear the whole loss; and this seemed a matter which should receive serious consideration. These were the reasons which had led the Board of Trade to refuse to insert the clause. He had not heard the evidence which had been laid before the Committee, and therefore did not venture for a moment to express any opinion as to what their decision should be. He only said that these were the reasons which led the Board of Trade, in the absence of any instruction or direction from Parliament, to their decision.

Some discussion arose as to the procedure to be adopted in regard to an earlier statement of the Chairman—that one Counsel should be heard after the statement from the Board of Trade. Sir R. Littler, who, with Mr. Oddie, appeared for the Colney Hatch Gas Company, against the Southgate Urban District Council Order, urged that he certainly had a right to speak. Eventually, the Chairman, having deliberated in private with his colleagues, said the Committee would hear him.

Tuesday, June 21.

Sir R. LITTLER said he appeared for the Colney Hatch Gas Company in a case in which the clause had been agreed, and he wished to draw the strongest possible distinction between cases where it was agreed and cases where it was contested. He asked the Committee to consider whether there was any inherent vice in the clause which made it improper to apply it under any circumstances. This was the doctrine laid down by the Board of Trade. If, however, he could show that it was not wrong in principle, away would go the argument against its insertion in agreed cases, and away would go the argument of the Board of Trade that it should be refused in all cases. If he could show that it was not wrong in principle, the proper authority to decide the matter, where it was contended, would be the high tribunal of Parliament. As regarded agreed clauses, it seemed to him that he was in the strongest possible position. He maintained that the clause was a matter as to which Parliament should decide; and he protested against any course of procedure, either by Provisional Order or otherwise, which would hand over to a department the control of matters in which the public had an important and vital interest. This would be the result if the Committee were to say that, even in agreed cases, they would not accept the clause—that, in effect, they would not permit the parties to come to a conclusion which on both sides was considered right and proper. The broad proposition was whether the Committee, after all that had taken place, would say that the Board of Trade were to be supreme, and that, whatever their action had been, Parliament would not review and consider it, because they had laid down a principle. In all cases the principle ought to be laid down by Committees of Parliament, by Parliament itself, and not by any department, however capable and well managed.

Mr. *Pelham* pointed out that he had particularly stated that he only gave the reasons which, in the absence of any decided direction from the House, had guided the Board of Trade.

Sir R. LITTLER went on to point out that there had been a number of decisions in which Parliament had said the clause should be allowed, though there were others in the opposite direction.

The CHAIRMAN said the Committee had practically decided the point to which Counsel was now addressing himself, as to Parliament dealing with the clause, by hearing Counsel.

Sir R. LITTLER said he would not say a word more on the point. Passing on to the statement of Mr. Pelham the previous day, he said that gentleman asserted that in several of the first cases the clause was inserted by agreement. But in the first case of all—viz., Bermondsey—this was not so. Then Mr. Pelham said that younger authorities, or those applying for the first time, would naturally object to it. In his (Sir R. Littler's) case, the authority were applying for the first time, and they had agreed the clause. The next statement of Mr. Pelham was that the clause as drafted did not appear to the Board of Trade calculated to accomplish the objects in view, and the Board considered, further, that if a scheme showed a loss probably the best way of rectifying it would be to reduce the price. This might or might not be so, but when there was a large increase in the price of coal, every gas company in the country raised its charges for gas to meet it. It seemed to be a very startling proposition that if a concern was making a loss on its trading it should always reduce its price. Yet this was the universal proposition—if there was a loss they were to be allowed, out of the pulic rates, to reduce the price. Shareholders in a company could always control their directors by insisting on callirg a special meeting; but ratepayers were not in this position. Thus, the local authority, if the clause were not accepted, would be left absolutely free from control—a most dangerous proceeding, and an extension, with a vengeance, of the doctrine of municipal trading. He had always understood that what Government Departments aimed at was to restrict local authorities and to take care that the people were protected; but this was the reverse of what the Board of Trade were doing. There was not a local government body, from county councils downwards, that was not controlled by some restrictive clauses; but in regard to this matter, though there might be the utmost extravagance, though there might be temptation to gain popularity by reducing the price of electricity in particular instances (as in the case of workmen's dwellings), they could go on as they pleased.

Mr. BALFOUR BROWNE said the Act forbade an undue preference being given.

Sir R. LITTLER said there were plenty of ways of avoiding this provision. The next suggestion of Mr. Pelham was that the clause might have the effect—possibly contemplated by the companies—of crippling the undertaking. It was hardly worthy of a public body to suggest that the companies were actuated by any such desire. It was an unreasonable slur to cast upon a gas company to say that they had the ulterior and secret object of crippling the undertaking, and certainly in the case of his Company it was not so. Mr. Pelham then said it would be difficult to define the first year's working. This difficulty had been met, in the clause he (Sir R. Littler) proposed, by the use of the words "at the expiration of the second financial year commencing after the undertakers begin to supply energy." Thus a start would not be made until after they had begun to supply energy. It ought not to be difficult to define what was the result of the first year's working after they had begun to supply. If there was, a new and serious objection to powers being granted them was raised. Gas and water companies were bound by the General Acts to supply to their shareholders an exact account of first, as well as of every other, year's trading. Consequently, the view of the Board of Trade in this

respect was fallacious. Mr. Pelham further said that, after even the third year's working, there might come a time when there was an opportunity for a local authority to develop their undertaking, possibly for some new estate, and the concern might be put to very considerable expense, which, although it might pay seven or eight years after they had started, might mean a loss for two or three years or more. He had no hesitation in saying that, under these circumstances, the local authority ought not to undertake to supply. No gas company, under similar circumstances, would consider it. They would say: You must put in force the Gas-Works Clauses Act, and guarantee us so much for so long. This was what a local authority ought to do. What right had a local authority, at the expense of a gas company as a ratepayer, to develop somebody else's estate by providing electric light for it at less than it cost? Such a thing would be most monstrous. The local authority had no right to develop the estate of a person—possibly a relative of a member of that authority—at the gas company's expense as a ratepayer. It never would be done by a gas company, it never ought to be done by an electric lighting company, and *a fortiori* it ought never to be done by a district authority supplying light, which authority, therefore, should have the utmost regard for the ratepayers it represented. It was also said that it did seem that a local authority, like all other undertakers, must be prepared to undergo a loss in order to have eventual gain. This was exactly what a gas company did not do. Unless a company had gas so close to premises that they could be called upon to supply, they did not give a supply unless they had an absolute guarantee of a percentage on the outlay. Why should a local authority give a supply in such circumstances, especially as they were dealing with public money? Mr. Pelham also said that the Act provided that any profit after 5 per cent. must go to the rates of the local authority, and if the ratepayers were to benefit by the profit, it did not seem unfair that they should undergo some risk of loss. This was exactly the worst vice that could be suggested against municipal trading—that they made every ratepayer, compulsorily, a shareholder. The public returns showed that Hastings in its twentieth year incurred a loss of £1080, and that Cheltenham in its seventh year incurred a loss of £3740, and there were other similar cases. He asked whether such losses were to be allowed to go on indefinitely? It was known that a quarter of the population moved away every three years. Thus a ratepayer might bear a loss and be out of the area when the profit came. Surely this was absolutely contrary to common sense and reason. In the present instance, after discussion, the Council had accepted the clause; it being agreed that two years should be given them to set their house in order before the clause should become operative. If this had been a Private Bill, there would not have been any possibility of the Board of Trade interfering. Mr. Pelham had made a further statement - that it seemed to be very difficult to say what was the expenditure for that year. If this was so, what was the use of all the Acts of Parliament under which accounts had to be kept? If it were the fact, the Acts compelling railway and other companies to keep accounts were useless. Then Mr. Pelham asked whether "the revenue for the year shall not be less than the expenditure for the year" meant the expenditure on the works or the expenditure after payment of interest and instalments for sinking fund? To this, he (Sir R. Littler) would answer that it did not mean the expenditure on the works, but the interest on the expenditure on the works. He should say also that it included the payment of interest and instalments of the sinking fund, because these were revenue charges. Mr. Pelham's next statement was that it was quite possible a local authority might find themselves at the end of a year with 4 per cent. in hand, which would be a profit if it was a company, and would go towards dividend; whereas, as a local authority had to pay 5½ or 6 per cent. for interest and sinking fund, there would be a loss on the year. This was so. If the whole of the charges did not meet the revenue, the loss ought to be made up by prices being increased; otherwise the present ratepayer would be made to pay for a property which would come into the ownership of a man 30 years hence, which was monstrously unjust. Further, companies had to pay a dividend and set aside money for depreciation; and anyone looking at the figures for the latter item would see how different they were in the case of a company and in the case of a local authority. It was argued that the gas companies might vary their charges every few months. But gas companies could not act in this way. Everyone knew that there was the greatest difficulty in raising the price of gas, even when necessary, owing (say) to an increase in the price of coal. Mr. Pelham said he gathered that there might be a saving from contracts, but that if contracts at a low price were saved it would put a most tremendous burden on the ordinary consumers, who would have to bear the whole loss; and this seemed to him to be a matter which should receive serious consideration. Counsel held that they should not make such improvident contracts if they were going to be such an enormous burden. But they could obviate the difficulty by a sliding-scale arrangement. After all, the manufacturer was a ratepayer, and ought not to carry on his manufactures at the expense of his fellow-ratepayers. Marylebone was a most striking instance of the way Parliament had negatived the claim of the Board of Trade. When the Marylebone Bill entered the House of Commons, a resolution was proposed giving an instruction to the Committee who were to consider the Bill that they should adopt the course which, roughly speaking, Committees had adopted. But this was negatived; the reason being, he thought, that Parliament did not like to fetter its Committees. Notwithstanding this, however, he, on behalf of the Great Central Railway Company, obtained the insertion of the clause in a modified form. Thus Parliament, in a case where the issue was distinctly raised, had absolutely negatived the whole of the principles laid down by the Board of Trade.

Mr. CLAUDE BAGGALLAY, at this stage, said the Huddersfield Order had been restored to the list before the Committee; and it had been agreed between the promoters, the Huddersfield Corporation, and the Longwood Gas Company (for the latter of whom he appeared), that the clause should be inserted. Perhaps the Committee would prefer him to deal with the case later on.

The CHAIRMAN said they would hear him at once.

Mr. BAGGALLAY said the Huddersfield Corporation had an Electric Lighting Order at present, under which they were supplying inside the borough and in a district outside called Linthwaite, and it was proposed to extend the undertaking to Golcar, another outside district. The Longwood Gas Company had works in Huddersfield itself, and in respect of these were large ratepayers, and they supplied also in the district now proposed to be served by the Corporation. A bargain had been made under which the Company withdrew a petition they had presented, on condition that the Corporation accepted the "Bermondsey Clause," though in a modified form. He was present therefore to support the insertion of the clause.

Mr. *Pelham* directed attention to a provision in the clause, as put in by Counsel, in this case that the Corporation should charge 10 per cent. more in a certain area.

Mr. BAGGALLAY said that was agreed. It was part of the machinery for giving effect to the arrangement between the parties, as regarded the extension to Golcar.

The room was then cleared, and the Committee deliberated in private for about an hour. On the re admission of the public,

The CHAIRMAN said: The Committee find that the preamble of all the Bills is proved. With regard to clauses, and specially with regard to this question raised under the "Bermondsey Clause," the Committee would be obliged to Counsel if they would bring up a clause carrying out the following provisions: The accounts of the undertaker shall be published annually in the form prescribed by the Board of Trade under the statute. The local authority at the end of five years after the undertakers supply energy in the case of a new, and of three years in the case of an existing, undertaking, and thenceforward triennially, shall, so far as is reasonably possible, revise its rates so that no loss shall be incurred by the ratepayers on the undertaking. Nothing shall prevent the local authority from entering into a contract to supply electrical energy on special terms; but the rates charged in future contracts shall be either subject to revision at the triennial revision, or rise and fall, but not, excepting by consent, below any minimum named in the contract, *pari passu* with the general rate fixed at the triennial revision, and the promoters in each case will decide which of these alternatives they prefer to be inserted in their Order. It is not intended to prevent or discourage a more frequent revision of the rate other than the contract rate, should the local authority desire to enter upon it. We do not want the clause drawn, you will understand, so that it can possibly be interpreted to prevent a revision annually or biennially if the municipality prefer to make it. This clause will be inserted in all the Orders in connection with which the point has been raised. The other Orders had not applied for anything; and, of course, it will not be inserted in them. With regard to the special clauses that are asked for in certain Orders, we agree that the clause for which the Hampton Wick District Council ask—provided that there shall not be made against the general district rate of the District Council in respect of street lighting or other municipal purposes for which energy shall be employed a charge at any higher rate than that charged to consumers using the energy for like hours of supply. We agree to the same in the Huddersfield case, and also to the provision with regard to Golcar and the 10 per cent. The same with regard to street lighting in the Malden and Coombe Order. These were all applied for; and we agree to them. I shall be much obliged if Counsel will bring up this clause to-morrow.

Mr. PADDON: There was a special clause asking that, before the local authority raised money, they should summon a meeting of the ratepayers.

The CHAIRMAN: Did you hand it in?

Mr. PADDON: I will hand it in. I referred to it in my speech.

Mr. NEVILLE: I asked for it in the Eastleigh and Hanwell Orders.

Mr. PADDON: It is simply to give effect to the Borough Funds Act.

Mr. ALLEN: It is really asking for the same class of protection as in the "Bermondsey Clause," but in another form.

Mr. PADDON: No; it is quite different.

The CHAIRMAN: Was this clause asked for in the Watford Order?

Mr. BAKER: Yes.

Mr. ALLEN: We have not had an opportunity of arguing against it.

The CHAIRMAN, after a brief consultation in private with his colleagues, said: The Committee agree to clause 3, because they have given it to the other Orders—the street lighting and municipal purposes clause; but we do not see our way to accept the clause requiring the ratepayers' consent.

On the meeting of the Committee on Wednesday, it was arranged that the clauses should be laid before them yesterday (Monday).

HOUSE OF LORDS COMMITTEE.

Monday, June 20.

(*Before the Earl of* DARTREY, *Chairman, the Marquis of* WINCHESTER, *the Marquis of* EXETER, *the Earl of* DARTMOUTH, *and Lord* DIGBY.)

BOGNOR GAS ORDER.

The object of this measure was to empower the Bognor Gaslight and Coke Company to construct further works for the manufacture and storage of gas, to extend their limits of supply, and to raise additional capital for the purpose.

The Counsel for the Bill were Mr. BALFOUR BROWNE, K.C., and Mr. PADDON; and Mr. H. C. HUTCHINSON appeared for the petitioners, the Bognor Urban District Council.

Mr. BALFOUR BROWNE, in opening, said the measure was a simple one, its main purpose being to remove the gas-works from the present position in Bognor and put them further in the country on the outskirts of the town. The Company had been in existence for 40 years, and, having obtained a Provisional Order, was a statutory concern. The Board of Trade were asked to make this Order; and before doing so, they invited the only opponent of the Bill—the Local Authority of

Bognor—to go before the Board. They did so, and the thing was thoroughly discussed. The removal of the works could be very easily brought about. The proposed site was near a railway, by means of which coal could be obtained. At the present time, the coal going to the works was liable to a coal due, which was paid to the Urban District Council of Bognor; and he believed that this was the ground of one of their objections to the promoters going outside and getting their coal by rail. The Board of Trade had cut the promoters down to £20,000 as the amount to be raised under the Bill. The standard price they were seeking to charge was 4s. 1d. per 1000 cubic feet. As a matter of fact, the amount they were at present charging was only 3s. 9d. The opponents of the Bill, in their petition, asked for the insertion of a clause compelling the Company to sell their undertaking to the Local Authority. But this matter had been fully gone into by the Board of Trade, who had said that there had been no default on the part of the Company, and that it was not a case in which the insertion of a purchase clause should be insisted on. The Board were of opinion that such an arrangement should not be effected unless the Company were consenting parties. The Company would not agree to the insertion of such a clause, as they did not wish to sell their undertaking at all. The petitioners said there was no occasion to remove the gas-works from their district, or to erect new works as proposed by the Order, and that the large capital expenditure was contrary to the interests of the Company and the gas consumers, and should not be sanctioned. Well, the Committee might trust the Company to know their own interests, and these interests were identical with those of the consumers. It clearly was not to the interest of either that they should go on paying 2s. a ton to the Local Authority, which, of course, the gas consumers had ultimately to pay in the price of gas. He explained the operation of the sliding-scale and the auction clauses, which further went to make the interests of both consumers and producers identical. The petitioners went on to say that the present site of the gas-works would be sufficient for years to come; but he maintained that it cramped the undertaking, and that it would be to the advantage of everyone to have the works removed. The petitioners went on to say that the additional capital asked for had been reduced by the Board of Trade from £35,000 to £20,000. This was true; but the result of this would be that they would only be able to go on for eight instead of fifteen years. This period he held to be too short a time for a Company to be out of Parliament. The petition in a further paragraph conveyed the impression that the petitioners and the Company were to agree to a clause on the lines of the Bolsover and District Water Order, 1903, enabling them to purchase the undertaking; but this was an entirely erroneous impression. It was not the Bolsover clause, but the Hailsham clause of 1903 that was proposed, which was an entirely different thing. A non-statutory company there came to Parliament and asked to have statutory powers; and a non-statutory concern was not in so good a position as a statutory one. If there was no statute giving a gas company power to supply gas in a district, the local authority was given the right to compete. It had a right to supply itself with gas for public purposes; and if the Board of Trade or the Local Government Board gave them power to raise the needful money, they would have the right to compete with the non-statutory company. On the other hand, the Public Health Act said that, where a gas company authorized by Parliament to supply was already in existence, the local authority should not supply gas. In the present case, the Company was a statutory concern; and when the Local Authority presented it with the Hailsham clause, he rejected it. They said they were a statutory Company. He did not know of a case in which, against the will of a statutory company, a clause had been inserted by Parliament except one—the Reigate and Redhill case. The Local Authority secured the clause in that case, though the Gas Company contended that the right way to obtain it would have been not by a clause in a Bill of the Company, but by a Bill of their own to which the ratepayers would have given their consent. The result was that the Company dropped the Bill; so the clause and everything else went. The Local Authority then proposed a Bill of their own; but the ratepayers refused their consent. There was no complaint against the Company. They had been in existence forty years, and everybody approved of the gas they had been supplying. The Local Authority were divided on the subject of the purchase clause—only 6 out of 12 having voted in favour of it. Replying to a member of the Committee, Counsel said they were asking for £20,000, a great portion of which was necessary for extensions of mains in order to meet the wants of the district. They proposed ultimately to sell a portion of the site of the existing gas-works, retaining the other portion for storage. The present capital of the Company was £15,000; but Bognor had grown, and was still increasing, very rapidly. In conclusion, he pointed out that the promoters had already run the gauntlet of a searching inquiry. All the questions now raised had been brought up at the Board of Trade investigation.

Mr. *Joseph Cash*, the Engineer and General Manager of the Brighton and Hove Gas Company, examined by Mr. PADDON, said the works of the promoters were in the centre of a residential district, whereas the new site was entirely away from the existing buildings. It was bounded on one side by the railway, who would allow a siding for the use of the Company. On the other side was a high road, which was available for the Company's mains to take in gas for the supply of the town. The present site was inadequate for the purposes of the Company, and there was no room on it for proper extensions. During the last two years, the rate of progress at the gas-works had been 10 per cent.; but it might be that during ten years it had averaged 9¼ per cent. They fluctuated on the South Coast according to the seasons. The amount of fresh capital the Board of Trade had allowed—£20,000—would last for about eight years. He did not think the original amount should have been altered, as it was not to the advantage of a small Company like this to have too frequent applications to Parliament, which were very expensive things. If the new site were sanctioned, there would be a saving of 9d. a ton on coal, or £143 a year, and they would not have to pay the Bognor coal dues of 2s. a ton; so that the gross saving would be close on £700 a year. Witness was taken through the points of the petition of the local authority, each of which he contested. The Company made a reduction of 5 per cent. in the price of gas to the Local Authority. The present price was 3s. 9d. per 1000 cubic feet. At Arundel the price was 4s., and at Littlehampton 3s. 11d. In these cases coal dues were not paid—making a further difference of 2½d. For a small Company 3s. 9d. was a low price. The last dividend paid by the Company was 11 per cent. per annum.

Mr. *Henry Lovatt*, the Chairman of the Gas Company, was next called as to the effect of the present gas-works on adjoining property. He stated that the owners would object to the existing works area being extended.

In cross-examination by Mr. HUTCHINSON, witness said that the Company's sale of gas was about 32 million cubic feet. The new site—six acres, near the railway—had been bought last year. They had purchased land near their existing works for storage purposes. There had been complaints as to the smell from the works; but they had had nothing in the shape of complaints from the Local Authority. They had contemplated moving their works long before there was a word spoken about purchase. Of course, they wanted to escape the coal dues in order to give the public the benefit of cheap gas. If a vote of the town were taken on the question of the coal dues, there would be two to one in favour of doing away with them. The £380 a year paid as coal dues was no doubt devoted to public purposes; but he did not know that it was used in a proper way.

Mr. *Joseph Cash* was here recalled for cross-examination by Mr. HUTCHINSON. He said that in 1895 Parliament fixed the Company's sliding-scale, giving them a standard rate of 4s. 1d., and probably in this rate it was contemplated that the Company would be paying the coal dues; but he could not admit that, in the proposed change of site, Parliament should take off 2½d. from the standard price on account of the coal dues. The removal of site would be a costly affair. It would cost an increased capital expenditure; but the saving of the coal dues and of the cartage would provide the means to meet it. He denied that the present site was sufficient for the Company's works, or that the capital asked for was in excess of the amount required.

Mr. *Lovatt*, recalled, said, in reply to Mr. HUTCHINSON, that great injustice would be done to the Company by its being purchased by the Local Authority. The Board of Trade had said they would put a purchase clause in the Bognor Order if both parties were agreed, and the Company said they would consider such a clause if it was sent to them. A clause was sent to them and rejected, because the arbitration was based upon the provisions of the Arbitration Act, 1899. The Directors could not agree to arbitration under the Lands Clauses Acts because they would have had to call a meeting of the shareholders. The shareholders had since held a meeting, and had declared that they were not willing to sell.

This was the case for the promoters.

Mr. HUTCHINSON then, without calling evidence, briefly addressed the Committee for the petitioners. He proposed to address himself to three points—first, to show that a purchase clause should be allowed; secondly, to show that the capital asked for in the Bill was exorbitant; and, thirdly, to show that the standard price should be reduced.

The CHAIRMAN refused to allow the Counsel to deal with the question of standard price, as it was not raised in the petition.

Mr. HUTCHINSON held that the capital asked for was excessive. Mr. Cash had shown that during the past three years an increased output of 8 million cubic feet had taken place, and that this rate was not likely to be exceeded; and it was admitted that if there was sufficient storage the only enlargement required would be in the matter of retorts. There would be no necessity for retorts if, as other people did, the Company manufactured a certain amount of water gas on the present site. The capital the Company were asking for was based upon an entirely false foundation. The amount of expenditure they had made during the last three years in the legitimate expansion of the undertaking (at the rate of £400 per million) would carry the Company on for some ten years to come. Taking the ten years, and seeing that the increase in three years had been 8 million feet, in ten years it would be 2⅔ or 3 times this amount, which would be 24 millions, which, multiplied by £400, would come to something like £10,000, as against the £20,000 asked for, with £6567 borrowing powers. The £20,000 would last the Company for 20 years, which was not in accordance with the practice of Parliament. He protested against the throwing away of a large amount of capital merely for the sake of evading the coal dues. As to the proposed purchase clause, he said that Parliament had over and over again granted it when a *quasi* statutory company such as this had come for increased capital and increased statutory powers. No injustice would be done. The Company had been receiving handsome dividends, and the arbitrator would base his award upon their present prosperity and future prospects. The Company would not lose, and at the same time the Local Authority would gain.

The Committee decided to allow the preamble to proceed.

Clauses were then adjusted; and the Gas Orders Confirmation Bill in which it was included was ordered for third reading.

Suicide by Gas.—An insurance agent named James Swithenbank of Horton, Bradford, was found dead in the scullery at his residence a few days ago. He had one end of an india-rubber tube in his mouth; and the other was attached to a gas-bracket. The gas was on full; and the deceased had an overcoat over his head. It was stated that he had suffered from pains in the head as the result of an accident.

New Water-Works at Street.—A water scheme for Street has been carried out, at a cost of £26,000, by which a supply is derived from springs at Rodney Stoke and carried across the moors in 9-inch pipes. There is a low-level reservoir with a capacity of 300,000 gallons, and a high-level one holding 150,000 gallons; both being covered in with concrete, to prevent pollution. There is at present a flow of about 200,000 gallons per day through the pipes; and it is expected that, with the addition of another spring not yet utilized, there will be sufficient in the dryest seasons to provide a supply of 100,000 gallons a day. The works were opened last Saturday week, when the Engineer of the scheme (Mr. A. O. I. Cotterell) presented the Chairman of the Urban District Council with a silver key, with which he opened the house for the purpose of starting the pumping machinery.

LEGAL INTELLIGENCE.

THE LONDON WATER COMPANIES' APPEALS TO THE HOUSE OF LORDS.

The cross appeals of the New River Company and the Metropolitan Water Board against the decision of the Court of Appeal on certain questions raised before them early in the year, in connection with the awards of the Court of Arbitration under the Metropolis Water Act, 1902, were opened in the House of Lords, before the Lord Chancellor, Lord Macnaghten, Lord James of Hereford, and Lord Lindley, last Friday. The judgments here appealed from were reported in the "JOURNAL" on Feb. 16 (p. 410) and March 8 (p. 635). The chief point at issue related to the limitation of the Company's profits and their liability, in conjunction with other Companies, to contribute to the sinking fund of the Chamberlain of London. On the former point, as well as on others submitted to the Court, the Company were successful; and against this decision the Water Board appealed. In regard to the sinking fund the Court was against them; and they accordingly decided to appeal to the House of Lords, whose judgment it was arranged should apply to the other Companies concerned. Mr. Fletcher Moulton, K.C., the Hon. J. D. Fitzgerald, K.C., and Mr. Shaw appeared for the Board; Mr. Balfour Browne, K.C., Mr. Cripps, K.C., Mr. Claude Baggallay, K.C., and Mr. F. W. Pember represented the Company. Mr. Moulton opened the case, and argued at some length in support of the decision of the Court of Arbitration that, according to the true construction of the New River Company's Act of 1852 and of the Water-Works Clauses Act of 1847, the limitation of profits mentioned in section 75 of the last-named Act applied to the profits of the Company. He submitted that their Lordships must decide one of two things—either that, on the interpretation in law, the incorporation of the General Act applied to the whole of the undertaking referred to and dealt with in the Act of 1852, or that, when they coupled it with the circumstances of the case, the incorporation applied not only to special works, but to "works connected therewith," which must include the whole of the works of the Company, and consequently their rates. He therefore maintained that the incorporation of the General Act made it apply to the entirety of the undertaking of the Company. After some further arguments, the hearing was adjourned till yesterday, when Mr. Moulton concluded his address by submitting that clauses 75 and 80 of the General Act applied to, and limited, whatever rates were set out in the Special Act, so as to cut them down when the amount of profit was more than would pay 10 per cent. He added that he did not ask for any limitation beyond this—that the profits in the future should be measured by an accumulation of 10 per cent. The Hon. J. D. Fitzgerald followed on the same side. At the close of the learned Counsel's argument, Mr. Balfour Browne and Mr. Cripps addressed their Lordships on behalf of the Company, and the further hearing was adjourned till this (Tuesday) morning.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Wednesday, June 22.

(*Before Lords Justices* VAUGHAN WILLIAMS, ROMER, *and* COZENS-HARDY.)

Attorney-General and Others v. Ashton Gas Company.

This was an appeal by the Gas Company from the decision of Mr. Justice Buckley, who held that they were not entitled to pay their statutory dividend free of income-tax, on the ground that this was equivalent to exceeding the authorized dividend by the amount of the tax. See "JOURNAL," Vol. LXXXV., pp. 218, 279.

Mr. HALDANE, K.C., and Mr. CANN, appeared for the appellants; Mr. DANCKWERTS, K.C., and Mr. R. J. PARKER for the respondents.

Mr. HALDANE, in opening the appeal, said the real point in question was whether or not the dividends declared by a gas company bore income-tax; and he should submit that, under the Income-Tax Acts, they did not—the tax being levied solely on the profits made. His submission was that the learned Judge, at the beginning of his judgment, assumed the whole point in dispute. If his major premiss were true, he (Counsel) submitted that the conclusion drawn by his Lordship naturally followed; but he contended that, under the Income-Tax Acts, the profits of a gas company came under Schedule A, and not under Schedule D, which referred to the income derived by individuals from business, professions, &c. The learned Counsel developed this proposition at some length—quoting various sections of the Income-Tax Acts. In the course of his remarks, he said the judgment in the case had caused what might be called a flutter among companies who had been in the habit of paying dividends, as the appellants had done, free of income-tax. After a long argument, he concluded by reading the judgment of Mr. Justice Buckley, and reiterating that the real question was whether the income-tax was charged upon the Company or upon the shareholders.

Mr. CANN followed with a short argument on the same lines.

The respondents were not called upon.

Lord Justice VAUGHAN WILLIAMS said he thought the judgment of Mr. Justice Buckley was quite right. The matter depended, as the learned Judge had pointed out, on sections 16 and 17 of the Ashton Gas Company's Act of 1877. Section 16 provided that the profits to be divided between the shareholders in any year should not exceed 10 per cent.; section 17 specified the price to be charged, and that the standard dividend should vary according as the standard price was lowered or raised. The whole question to be determined was whether, in estimating what had been paid as the standard rate of dividend, there ought to be included the income-tax paid by the Company as part of that which went to make up the standard dividend. It was not really denied in argument that that which had to be divided among the shareholders was the profits of the Company, nor that the income-tax was part of the profits, and not something to be deducted before arriving at the amount of those profits. Mr. Justice Buckley had put it so plainly that he could not really add anything to it. After quoting a passage from the judgment, his Lordship went on to say that no doubt it was true that, having regard to the provisions of the Finance Act with reference to income-tax under Schedule D, the income-tax, in a case like the present, was assessed on the profits of the Company; but that this was the mode of collecting the tax by no means negatived the proposition that the Company were paying the tax on behalf of the shareholders. Mr. Justice Buckley had pointed out that not only was there nothing outside the provisions of the Act to prevent the Company in such a case from deducting the rateable proportion of the income-tax from the dividend paid to each shareholder, but that section 54 of the Company's Act made a positive provision to this effect. He also referred to the provisions of section 60 (one clause of which had been relied upon by Mr. Haldane), and came to the conclusion that there was nothing in this clause inconsistent with the application of section 54 to the present case. He agreed with the learned Judge that under it the shareholders were bound to allow the deduction of income-tax. It necessarily followed that the income-tax paid by the Company was paid on behalf of the shareholders. The appeal therefore failed, and must be dismissed.

Lord Justice ROMER gave a short judgment to the same effect.

Lord Justice COZENS-HARDY concurred.

The appeal was therefore dismissed, with costs.

HIGH COURT OF IRELAND—CHANCERY DIVISION.

(*Before Mr. Justice* BARTON.)

Wednesday, June 15.

Thompson and Son v. The Corporation of Belfast.—An Alleged Nuisance from the Gas-Works.

This was a case in which Messrs. William and Hugh Thompson, trading as James Thompson and Son, a firm of linen and cambric handkerchief manufacturers in Belfast, sued the Corporation, as proprietors of the gas-works, to recover damages laid at £1500, and sought an injunction to restrain the defendants from causing or permitting smoke, effluvia, and noxious gases to issue from the works so as to cause nuisance or injury to the plaintiffs.

Mr. C. E. MATHESON, K.C., Mr. A. H. BATES, K.C., and Mr. W. M. WHITAKER appeared for the plaintiffs; and Mr. JOHN GORDON, K.C., M.P., Mr. R. H. HARRISON, K.C., and Mr. A. K. OVEREND represented the defendants.

Mr. MATHESON, in opening, said the nuisance of which complaint was made had been growing for years, and was now intolerable. It was a nuisance not only in a domestic sense, but was highly injurious to plaintiffs' trade, which required purity of atmosphere and freedom from dirt. The Corporation acquired the gas-works in 1874; and the nuisance from them to the locality had been an increasing one as the years went on. In 1891, the Corporation began to erect a new retort-house, which came into use in 1896 or 1897. It was 200 feet in length, and was immediately opposite plaintiffs' factory. The complaint was not of the manufacture of the gas, whatever effect this might have on other people, but of the emission of smoke and grime. The charging and drawing used to be done by hand; but recently machinery had been employed. Showers of water were sent on to the hot coke; and the result was immense volumes of smoke and granular stuff of an exceedingly coarse character.

Justice BARTON: How does it get out?

Mr. MATHESON said that whoever constructed the retort-house was more concerned for the architectural beauty of the building outside than in making provision for ventilation, or the escape of smoke and other stuff. At first there was an arrangement which would not work; and the result was that the men were being suffocated. Some fresh method of ventilation was therefore absolutely necessary; and an extraordinary expedient was adopted. Mr. James Stelfox, the Engineer, who was a man full of resource, began to read about experiments for ventilating long tunnels; and as the result of his studies, he adopted the plan of making thirteen large holes, 7 feet by 8 feet, in the roof. These were not chimneys, but were simply boxed about with tin. This arrangement was put into operation in 1902. The effect was simply terrible in the neighbourhood. The stuff was carried up to the height of the roof, but no higher; and when there was an easterly wind blowing, the result was a shower of particles of coal, coke, grime, and colley, with smoke and soot, to such an extent that the path could be felt grinding under foot as one walked. Plaintiffs at such times could not open a door or window in their factory without damage to their goods. Every experiment undertaken was from the point of view of the men engaged in the works, and utterly regardless of the nuisance to the people in the locality, who had to carry on business as best they could. It was a surprising fact that there was no appliance in the works for consuming smoke. It would be proved that so great was the damage the plaintiffs suffered, that it would be impossible for them to continue their business if the present state of things went on. Goods had to be washed over and over again in the laundry attached to the factory; but in spite of every precaution, they were utterly destroyed. A wire netting had been placed over the windows, but to no purpose. As soon as people in the neighbourhood threatened proceedings against the Corporation, they were quietly bought over. In 1897, there were no less than nine actions by persons claiming injury to paint and furniture. The Sanitary Officer reported that it was dangerous to health; but he (Counsel) had seen resolutions distributing £100 among the claimants, and giving the Solicitor £8 per head for costs. His clients did not share in such an arrangement, and until 1902 did not adopt a hostile attitude. In that and the following year, however, they had made various efforts to

obtain a removal or mitigation of the nuisance; and the present action resulted from a failure of these efforts. As a defence, the defendants pleaded, first, a twenty years' user; then a forty years' user; and afterwards a lost grant. These pleas were made in defence of a nuisance caused by a building which bore date 1891, but was not used until the winter of 1896. They had nothing to do with the case. The Corporation pleaded that they were bound to supply gas to the people of Belfast; but the Act of Parliament did not justify them in giving the citizens gas with one hand and poisoning them with the other. It expressly stated that they were liable for any nuisance caused by the manufacture of gas.

Friday, June 17.

Mr. *R. I. Calwell*, a civil engineer, and a former member of the Corporation, examined by Mr. BATES, proved the plans of the building objected to, which had a frontage of 70 feet and a depth of 191 feet, and contained 288 retorts. The plaintiffs' premises were distant about 52 feet. He described in detail the damage plaintiffs had suffered.

Cross-examined by Mr. GORDON, witness admitted that the works, on which very large sums of money had been expended, had been there ever since he remembered. They had been carefully built; the new retort-house having cost £4000. But he did not agree that the Corporation had adopted the best means of making gas. He believed he could, for a not prohibitive sum—perhaps £10,000—provide sufficient ventilation for the building.

Dr. *W. A. Dunn*, who said that since 1887 he had lived next door to plaintiffs' factory, described the growth of the nuisance, and its present serious character. His mother and some others brought actions in respect of it against the Corporation, and received compensation.

Dr. *Thompson*, also residing in the district, agreed as to the character of the nuisance. He said that when the wind blew from the east, a person could not be recognized standing on the railway bridge some 230 yards away.

Cross-examined by Mr. GORDON, witness admitted that, notwithstanding bad smells and other objectionable matters, the houses let well. He never had attended a person whose illness had been brought about by the odours of gas. The retort-house had not been working for a couple of months past; and the nuisance (which had become infinitely worse within the past few years) had ceased since then.

Mr. *James Guiler*, a chemist, Mr. *Thomas Smith*, a grocer, Mr. *Joseph Nicholson*, a tailor, and Mr. *James Brady*, who has lived in the locality for twenty years, each described the nuisance from his own point of view, and the injury it caused to trade and property.

Wednesday, June 22.

The proceedings were resumed to-day by the calling of some half-dozen more witnesses who bore out the statements of Counsel as to the damage caused by the smoke, &c., in the locality. Several of these witnesses, however, admitted that they had never lodged a complaint with the Corporation.

Mr. *William Thompson*, head of the plaintiffs' firm, said their principal business was preparing and finishing material for the market. Since the retort-house complained of had been put up, they could not open any of their windows; and white goods were often destroyed. On the landing, it was impossible to open the windows, notwithstanding the high temperature; and the workers complained of want of fresh air. In July, 1902, he wrote to the Corporation complaining that he had to close his works owing to the quantity of soot that entered the windows. The Gas Committee sent a reply saying they were taking precautions, and that experiments were being made with the view of removing the nuisance. Nothing was done, however; and the trouble got steadily worse. Indeed, at times one could scarcely breathe there. Again, in June, 1903, they complained, stating that it was a shame and disgrace that they should still be annoyed with the soot and smoke which came out in clouds from the gas-works and destroyed their goods. The firm added that they did not intend to stand it any longer, as their warehouse would not be worth one-half what was paid for it if the nuisance was continued. On receipt of a reply that the complaint should be laid before the Gas Committee, legal proceedings were commenced. If this state of things continued, his firm could only carry on their work at great expense, trouble, and annoyance. He described how the counters, and even the lavatories, were coated with colley and grime every morning. Since the retort-house ceased working, the flags on the streets outside his premises had been quite clean, whereas previously they were covered with colley and soot.

Cross-examined by Mr. GORDON, witness said the colley and grime from the chimneys of his own establishment would be infinitesimal. They burned coke, and there was little smoke. Since the holes had been made in the retort-house roof, the nuisance had become much greater. Mr. Stelfox admitted to witness that the attempt to stop the nuisance had been unsuccessful, and that the money had been foolishly spent. Witness was not aware that the retort-house was not working during the summer months. He believed Mr. Stelfox had done all he could to stop the nuisance.

Professor *C. R. C. Tichborne*, Gas Referee in Dublin under the Board of Trade, deposed to having made an inspection of the gas-works in April last. Previously he had received from the plaintiff a parcel of handkerchiefs for examination; and he took other samples during his visit for the purpose of analysis. The retort-house was not working when he made his examination. Having regard to the fact that it contained 288 retorts, he thought the house was too small and badly ventilated. When the water fell on the white-hot coke, it threw off a great quantity of ashes, something the same as from a volcano on a small scale. The arrangements for letting the smoke escape were of almost peculiar character. Two of the so-called chimneys near the plaintiffs' premises were fitted with fans; and the result of this would be that the smoke and ashes would be sucked up and driven off with great force into the air. This might purify the air inside, but would contaminate it outside. He saw the colley in almost every room of the plaintiffs' premises, and found much of the stock stained and spotted. He had examined many of the handkerchiefs, and found they contained not only carbon but iron. The iron, in his opinion, came from the lids of the retorts and the pyrites in the coal. The effect was to produce iron-mould on the handkerchiefs, which rendered them commercially useless. He saw the way the retorts were charged by machinery; and the result was to produce much more smoke than usual. Witness said he had studied other large works, and knew the Dublin Gas-Works well. He believed the retort-house in the latter was better than the Belfast one. He did not know that the method of charging the retorts was the same in both places. He did not see the retort-house in Belfast working; and what he had to say about it was a matter of theory. The ashes he had described would not emanate from a chimney in an ordinary house. With regard to the retort-house, he thought it should be practically open all round; it was a mistake to try and force the ventilation through holes. He was of opinion that a new house should be built on the other side of the river, and the present one abolished. Apart from the question of ventilation, it was badly situated, because everything was jammed together. In Dublin, the retort-house was better, and did not cause the same nuisance. He did not know that a Corporation expert had reported in 1892 that the works were very much congested; but he concurred in this view.

Cross-examined by Mr. HARRISON, witness said he was not aware that it was after this report that the manufacture of water gas was adopted. In his opinion, what caused the injury to plaintiffs' premises was that the coke was quenched in masses too quickly during the cooling process.

Mr. HARRISON: You think it is better to have it taken out by hand?

Witness: I think this would allow the mass to cool more slowly.

Is it your opinion that the proper way to work the house is to have men to rake out the retorts by hand?—Nothing of the sort. I only say the present system is bad.

Do you complain of the mechanical contrivances increasing the nuisance?—I think they cause a greater distribution of grit and ashes, because the coke comes out more constantly. But I think the chief cause of the nuisance is the bad system of ventilation in use in the retort-house.

On the resumption of the proceedings on Thursday, Mr. Bates read a number of documents, including minutes of the Public Health Committee, from which it appears that complaints of the nuisance from the gas-works were made in April, 1901, and referred to the Sanitary Officer for report. This concluded the case for the plaintiffs. Mr. Gordon then opened for the Corporation; and at the conclusion of his speech, evidence was given by Mr. Stelfox and Mr. W. F. Cotton, the Vice-Chairman of the Alliance and Dublin Gas Consumers' Company. Mr. Cotton had not completed his evidence when the hearing was adjourned until to-morrow (Wednesday). A report of last Thursday's and subsequent days' proceedings will be given next week.

DUBLIN POLICE COURT.—Monday, June 13.

(*Before Mr.* DRURY, *Divisional Magistrate.*)

Question as to the Depth of Laying Gas-Mains.

To-day the hearing was resumed of the summons taken out by the Alliance and Dublin Consumers' Gas Company against the Dublin County Council, in connection with the laying of certain gas-mains in a thoroughfare called Harold's Cross Road, within the jurisdiction of the defendants as road authority. In that capacity they had served upon the Company, through their Surveyor, a series of requisitions, with conditions, as to how the road should be broken up, how and to what depth the mains should be laid, and the manner of refilling the trench. The Company refused to be bound by the conditions, and brought the action calling upon the Magistrate to exercise his statutory authority by declaring in what manner the work should be carried out. The case was partially heard on the 17th ult. (*ante*, p. 518), and there were two adjournments for convenience of Counsel and witnesses.

Mr. IGNATIUS O'BRIEN, K.C., appeared on behalf of the Company; Mr. T. M. HEALY, K.C., M.P., and Mr. J. J. CLANCY, M.P., represented the Council.

From the evidence on the previous occasion, it appeared that one section of the main is laid under streets within the jurisdiction of the Corporation, who did not object to the depth of 2 feet, at which the Company laid the pipes. Another section in Rathmines township put down to the same depth was also approved of by the local officials. The section in dispute, which is the connecting link between the other two, is under the control of the County Council, who required, among other things, that the depth should be 3 feet, instead of 2 feet. This was the main point at issue.

Counsel for the Company said he had not yet formally closed his case; but he would allow the defendants to go on in order to accommodate their Counsel.

Mr. HEALY then stated defendants' case, which, he declared, was one of enormous importance to the public, and certainly those residing in the city and county of Dublin. The net point involved was whether it was to be the County Council or the Company who were to have the control of the King's highway. If a decision were given in favour of the Company, it would mean that a private Company plying for profit and selling a deleterious agent had the power of controlling for all time traffic on the public road. The proper test for the laying of gas-mains was that the depth must be such as to render the pipes safe from the "ordinary traffic" since the date of the Local Government Act of 1898 He complained that the expert evidence given on the last day did not disclose the character of the pipes. Since the defendants had begun to use steam-rollers, they had broken these pipes; and in the litigation which followed before the Master of the Rolls, and afterwards in the Court of Appeal, the ultimate decision was that, as to future works, no injunction was to issue against the County Council in connection with their steam-rollers. The injunction was confined to pipes already laid. The County Council were determined to put an end to the arrogant claim which the Company had tried to establish. They said that, no matter at what depth they put their pipes, the County

Council were liable if they broke them. He was there now to say that the County Council would put their heaviest rollers over these pipes the day after they were laid, and they would maintain that the Gas Company had no remedy for damages where they had violated the Council's requirements. The Company was a private money-making concern. The County Council were an unselfish body there to protect the rights of the public; and they declined to allow the Company to put down mains with an egg-shell cover, or to permit the Manager of the Company to say that he was a better judge of how a road was to be opened and filled in than the County Surveyor. The Gas Company, of course, so long as they did not endanger the safety of the roads, could lay their pipes at whatever depth they liked, and the County Council would not interfere with them, provided they agreed to forego all claim to compensation from the County Council whenever any of their pipes were broken by the steam-rollers.

Mr. DRURY said Mr. Healy was perfectly right in saying that they had no evidence on the last day to show what was the quality of the pipes which were being laid in this disputed section. They should have some information on this matter.

Mr. *Spencer Harty*, the City Engineer, was then called and examined by Mr. O'BRIEN. He said he had over 40 years' experience, and was often brought into relation with the laying of gas-mains and pipes through the city. He prescribed 2 feet of cover for laying gas-mains. So far this had been ample to prevent damage and injury to the pipes in the city of Dublin. He had not, within the last few years, known of any case of breakage of pipes by reason of their being laid at this depth. The proposed plan of the plaintiffs for laying the mains and restoring the roads as communicated to the County Council was perfectly consistent with the requirements of public traffic. The Corporation used rollers 10 tons in weight for street rolling.

In cross-examination by Mr. CLANCY, witness said it was true that their rollers were got specially light to avoid all risk of breaking pipes; but even with a heavier roller, he believed there was very little chance of breaking a pipe if it was properly laid and the road consolidated about it. If the earth were not properly filled in, 2 feet might not be sufficient. He had gone through the requirements served by the County Council on the Gas Company; and with the exception of one or two of them, with reference to filling in, he thought them reasonable and fair. But they only set out in more detail what the Gas Company had stated they were prepared to do themselves.

Re-examined by Mr. O'BRIEN: When a trench for a main was dug and filled in again, three months' user of the road should be sufficient to show whether or not it had been properly repaired.

Mr. O'BRIEN: Your Lordship will remember the County Council want us to keep the whole road in order for twelve months.

Mr. DRURY (to witness): You are perfectly well acquainted, I presume, with this Gas Act as it is called. Do you think you are sufficiently protected by its clauses against the Gas Company in case of any damage in the breaking up or repair of the roads?

Witness: I do, if it were improperly done.

Have you ever had any occasion to enforce the remedy?—I do not think so. We always settle our points of dispute amicably when they arise.

Mr. *Edmund Waterfield*, who has charge of the distributing and outdoor department of the Gas Company, said he had the direction of the work in question. In the sections within the jurisdiction of the Corporation and the Rathmines Council, the depth of the mains was 2 feet; but the County Council wanted them put down 3 feet. This would be most inconvenient, and would necessitate syphoning.

Mr. *William Collen*, the County Surveyor, was then called on behalf of the defendants. When he got the Gas Company's notice and plan of the work in dispute, he did not think their specification as to how they would open and repair the road was sufficiently particular. He therefore prepared all his requirements and consolidated them into the document proved on the last day. He thought it might become important afterwards in case of any controversy over what they had actually asked the Company to do. He considered all his requirements important; but the one in reference to the uniformity in the laying and bearing of the pipes was the most important of the lot, because neglect in respect of it was the most frequent cause of pipes breaking.

Mr. CLANCY: I suppose if the Company accepted responsibility after laying the pipes at 2 feet, you would not have any objection, no matter what depth they put them?

Witness: I would not care what depth they laid them at if they took the risk of damage to them.

Then, of course, the question comes to what is the proper depth if they do not give an indemnity, and if they do not take responsibility?—If they hold me liable, I say the pipes should have 3 feet of covering or more. There will be always danger to the pipes if they are not laid at that depth.

In considering this question of depth, you have to consider not only the depth of the main, but also the depth of the service-pipes leading from the main?—That is so. If these mains are laid at a depth of only 2 feet, the service-pipes, of course, from this main must be laid at a less distance. The main is generally laid at one or other side of the road. If a service-pipe was taken off to a house on the opposite side, it is well-known that a gas pipe must be laid at an inclination, and if the main is only down 2 feet, you may have the service pipe within a foot of the surface of the road at the opposite side.

Mr. DRURY: Would not that be contrary to law? In these and other matters where you suggest the probability of damage, are you not sufficiently protected by the clauses of the Act? If they are in default by any negligence or disobedience of regulations, can you not come down on them and get your penalties?

Witness: Have I jurisdiction to interfere in these matters about the making of trenches and their refilling, and the laying of pipes? If the Act says that unless so and so is done properly, there is your remedy. It is a question of law.

Mr. CLANCY: I will have to argue that on another occasion.

Mr. DRURY: That is what interests me.

Witness having been taken through the various clauses of the requisition served by him on the Company,

The proceedings were adjourned till next week.

GAS-MAINS AND THE LAYING OF ELECTRIC CABLES.

Successful Action by the Chepstow Gas Company.

At Chepstow, on Friday, the 17th inst., there was a special sitting of Magistrates, to deal with two summonses preferred by the Gas Company against the Electric Light Company. The first matter complained of was that the Electric Light Company had failed to give the necessary three days' notice of their intention to open up trenches; and the second, that their mains were laid in such close proximity to the gas-mains as to render the latter difficult of access.

The proceedings arose out of an arbitration held last February by Major Cardew, as the result of an application to the Board of Trade by the Gas Company, who said that the Electric Light Company had failed to comply with their request (during the course of the laying of the cables) for the protection of the gas mains and pipes and the securing of access thereto. The Gas Company asked that certain trenches where it was alleged the cables had been laid too close to the mains should be reopened and the cables relaid; and they also pressed for proper notice of future operations, to enable them to see that everything was satisfactorily carried out. Major Cardew, in his award, found that the Electric Light Company had failed to give the Gas Company the requisite three days' notice before commencing to dig trenches for the laying of their cables; and that certain of the electric lines were laid in such a way as not to afford protection from injury for, and access to, the gas-mains. He held, however, that the allegation of the Gas Company that the trenches were filled up in an unworkmanlike manner was not proved. He ordered the Electric Light Company to pay the Gas Company £36 6s. 6d. as compensation for loss and damage, as well as the costs of the arbitration and award.

When the case was called on last Friday week, Mr. Parnall (who appeared for the Electric Light Company) questioned the jurisdiction of the Magistrates. He said the proceedings were taken under section 18 of the Electric Lighting Clauses Act, 1899; and the matter of complaint appeared in clause 1. In clause 4, it was provided that any difference which might arise should be settled by arbitration; and his point was that everything in dispute was to be determined in this way. He also contended that the summonses failed because they had not been taken out within six months of the alleged offence—the cables having been laid between September and November last. Mr. Lawrence (for the Gas Company) said his clients were acting strictly in accordance with section 18, which provided that all differences should be referred to arbitration. This was done; and they now came to ask the Magistrates to enforce sub-section 5, which distinctly provided for additional penalties recoverable at that Court. As to the second point, the summonses could not be taken out until after the arbitration had been held; and, besides, the position of the electric cables was a continuing nuisance. The Magistrates over-ruled the first objection; but they held that the summons relating to the three days' notice failed, as it had not been taken out in time. As to the second summons, they were of opinion that there was a continuous offence.

The Gas Company's case was then opened by Mr. Lawrence, who said it was a matter of great regret; but the Electric Light Company had treated the Gas Company badly, and they were compelled to take proceedings to protect their property. He recited the evidence given at the arbitration, to the effect that the electric lines were so close that the gas mains in certain streets were not get-at-able, and that in two places they were unable to connect two buildings except through other people's services. He maintained that the Arbitrator found on all points for the Gas Company, and urged that the damages awarded in "full compensation" did not mean full satisfaction for all injury. He asked for a daily penalty from that day until the requirements set out were complied with.

Evidence was given by the Gas Manager (Mr. J. L. Rust) as to the undue proximity of the cables to the gas-mains, and the non-receipt of the three days' statutory notice. In cross-examination, he said that 6 inches was not sufficient distance to allow between the cables and mains; and he did not know this was the distance allowed in towns all over the kingdom. He could not give a single instance where an explosion had taken place because the two were 6 inches apart. What he really apprehended was not an explosion, but the difficulty which would be experienced when it became necessary to repair a main. No money payment would adequately compensate his Company.

Mr. Parnell contended that the whole matter referred to in the summonses had been dealt with by the Arbitrator, who had full power to impose a penalty. The Electric Company were ordered to pay an amount in "full compensation;" and this covered any prospective discomfort. The Gas Company desired to go behind the award.

Evidence having been given by the Engineer who laid the cables, that there was sufficient access to the gas-mains, and by another witness that the Gas Company at the arbitration withdrew all claims to penalties, the Magistrates decided that the Gas Company had made out a case; and they found, therefore, in their favour. They thought the Gas Company were justified in coming to the Court, as it was their only method of obtaining a judgment. They imposed a penalty of £1, with a daily penalty of £1; the costs of the Court to follow the decision. In the dismissed case (that of omitting to give three days' notice), each party would have to pay its own costs.

On the application of Mr. Parnall, the Magistrates subsequently stated a special case upon the points of law raised by him.

Charge of Embezzlement against a Secretary.

Mr. Joseph Speakman, the Secretary to the Longton Gas Department, was remanded in custody at Longton last week on a charge of embezzling the sum of £39 belonging to the Corporation. The Town Clerk (Mr. G. C. Kent), who prosecuted, stated that the investigation into the case was proceeding, and would necessarily take a considerable time. The prisoner was arrested the preceding Saturday, on a warrant, in consequence of facts which were brought to light during

the recent annual audit of the accounts of the gas-works. It is understood that the alleged misappropriation of moneys belonging to the Gas Committee have been discovered to be very serious.

Conviction for Selling Spurious Welsbach Mantles.

At the Central Criminal Court, on Thursday, before the Common Serjeant (Mr. F. A. Bosanquet, K.C.), Woolf Weisberg, 23, clerk, and Max Strauss, 22, traveller, were found guilty of "falsely applying a certain trade description to 3120 incandescent gas mantles, and of having in their possession, for purposes of trade, the trade marks thus falsely applied." The facts were fully reported in the "JOURNAL" last week (p. 888). Mr. Bodkin and Mr. Boyd prosecuted on behalf of the Welsbach Company; Mr. Rooth and Mr. Vaughan-Roderick defended Weisberg. It was stated in the prisoners' defence that they were in the employ of another German, who could not be found. Strauss, who had been previously convicted, was sent to prison for nine months, and Weisberg for four months.

Compensation for Poisoning by Coal Gas.

In the City of London Court, a few days ago, Messrs. J. G. White and Co., a firm of contractors, were sued by Mrs. Davis, the wife of a greengrocer at Cricklewood, for £50, compensation for personal suffering caused by the alleged negligence of their servants. The Middlesex County Council have been laying a light railway through Cricklewood, and it passed the shop kept by her husband, who was assisted in his business by the complainant. While the railway work was in progress, the Willesden Urban District Council decided to have the roadway repaved, and the defendants were entrusted with both contracts. The plaintiff's case was that the men did their work so badly that they punctured 42 gas-pipes in 600 yards. The gas escaped, and while the plaintiff was standing outside her shop she inhaled so much of it that she became unconscious, and was ill for a long time. The defendants denied that their men were careless, and said the repairs were carried out as soon as possible. The gas-mains were so undulating that it was impossible to tell exactly where they were. Gas escaping in the open air could not have caused the plaintiff's injuries. Evidence was called on behalf of the plaintiff to show that men had been known to die as the result of swallowing coal gas in the open air. Mr. G. F. L. Foulger, the Distributing Engineer of the Gaslight and Coke Company, said that the mains throughout London were necessarily zigzag, or they would become obstructed with water of condensation. The Jury found for the plaintiff for £15; and costs were given on the higher scale on account of the public importance of the case.

Disputed Liability for a Gas Account.

At the East Grinstead County Court last Wednesday, before his Honour Judge Scully, the East Grinstead Gas and Water Company sued William J. Heath, a local tradesman, for £21 13s. 5d., the balance of an account. Mr. F. S. White appeared for the Company; Mr. E. P. Whitley Hughes represented the defendant. Mr. Hughes explained that the defence was that Mr. Heath, who formerly carried on business as a clothier at 75, High Street, executed a deed of assignment to a trustee, in favour of his creditors, on Oct. 23, 1902. His wife bought the furniture and stock, and carried on the business at the same premises until Feb. 7, 1904, when she also executed a deed of assignment in favour of her creditors. His point was that Mr. Heath was not in occupation of the premises when the debt was incurred, inasmuch as the business had been assigned to his wife. For the plaintiffs, it was stated that when anyone required water or gas, application had to be made for it. No demand had ever been made by Mrs. Heath, and the Company were not aware of any change of tenancy. The £21 13s. 5d. was part of a continuing account of the defendant, who paid something off in December last. Defendant was called, and said he was present when the furniture and stock were sold to his wife. She carried on the business, and he had nothing to do with it. Questioned further by Mr. Hughes, he admitted that he was the tenant of the premises; but he afterwards qualified this statement by saying he lived upon them with his wife. Thereupon Mr. Hughes resumed his seat, and said he was bound to give in by the defendant's answer. Judgment was accordingly given for the plaintiffs.

International Gas Exhibition, Earl's Court.—The Right Hon. Gerald Balfour, the President of the Board of Trade, has given his patronage to the exhibition. Among others who have also given their patronage, we note the name of the Lord Provost of Glasgow.

Torquay Corporation Water-Works.—In accordance with annual custom, the members of the Torquay Town Council paid a visit last Friday to the water-works at Tottiford, on the borders of Dartmoor. Particular attention was paid to the new reservoir which is being constructed in the Trenchford Valley, the capacity of which will be 200 million gallons. The Mayor (Mr. John Taylor) presided at a dinner which followed the inspection, and in proposing the toast of "Success to the Torquay Water Undertaking," said that when the works in progress were completed there would be a total storage capacity of 500 million gallons, and the quantity as well as the purity of the water supply of Torquay would be second to none in the kingdom. Alderman E. P. Bowey, the Chairman of the Water Committee, in replying, said they had it on the high authority of Professor Frankland that theirs was one of the best waters to be found anywhere. The Corporation were doing everything possible on the watershed to prevent pollution of the water, which was now beyond suspicion. In a subsequent speech the Mayor spoke highly of the services of Mr. C. S. Chapman, the Water Engineer, under whose direction and supervision the new works are being carried out. Two members of the Council, who are engaged in building, also bore testimony to the satisfactory progress of the work, and to the skill and ability shown by the Water Engineer and his staff in carrying it out.

MISCELLANEOUS NEWS.

THE COMMITTEE ON METROPOLITAN GAS TESTING.

Abstract of the Evidence.

The following is a continuation of our abstract, which was commenced last week (p. 888), of the evidence submitted to the Departmental Committee on Gas Testing, who sat at the Board of Trade, Whitehall, earlier this year.

Fourth Day.—Tuesday, March 1.

Professsor VIVIAN B. LEWES.

This witness occupied the whole of the fourth day's sitting. All "JOURNAL" readers know his qualifications for speaking on the matters under the consideration of the Committee; but it is interesting to recall that he was Vice-President of the International Photometric Committee, and was Secretary to the Photometric Standards Committee of 1892. The prepared evidence-in-chief of the witness was directed to showing that the tendency at the present time in gas manufacture was towards the reduction in illuminating value of gas and a consequent lowering of price; the introduction of the incandescent mantle having done away with the necessity for gas of high illuminating power. He told the members that in Berlin and most of the prominent German cities, more than 94 per cent. of the lighting by gas is at present done with the incandescent mantle; and there was no doubt that now that cheap mantles were being introduced in this country, it was only a question of time for the flat flame to become practically extinct. This movement, he held, would be greatly accelerated by a reduction in candle power. The reduction would undoubtedly have a serious effect upon the light-giving power of such flat-flame burners as were ordinarily employed for household use, and would tend to the general adoption of incandescent lighting. Showing that the flat-flame burners in general use were totally unfitted for gas consumption, he stated that thirty collected at random from houses of consumers, with 16-candle power gas, gave—the best 10·6 candles per 5 cubic feet, and the worst 3·1 candles. Of the total, 56 per cent. gave less than 7 candles per 5 cubic feet. England, he reiterated, was far behind Germany in the use of incandescent lighting; but nevertheless an inquiry made in the spring of last year into the uses to which the coal gas supply of a large town was put gave the following information: Incandescent lighting (private), 12 per cent.; incandescent lighting (public), 6·25 per cent.; cooking, 23·75 per cent.; gas-engines, 5·50 per cent.; used in other ways, 52·50 per cent. So that 47·5 per cent. of the whole supply was employed for purposes in which illuminating power was of no use, and calorific effect was the one important factor. It was also seen that 18·25 per cent. of the total gas made was used for incandescent lighting; and this represented somewhere about 23 per cent. of the gas used for illuminating purposes. The 23 per cent. thus used gave, for a consumption of 5 cubic feet, not less than 70 candles; while the average light obtained by the combustion of the remaining 77 per cent. was 8·5 candles. In London, above 75 per cent. of the gas used for street lighting was employed with the incandescent mantle. It was clear that, under such conditions, the supply of a high candle power was simply waste of money; and it was manifestly unfair that the consumer of average intelligence, who was willing to utilize the benefit given by the incandescent mantle, should have to pay for a quantity of gas only rendered necessary by the inertia of those who declined to advance with the times.

Witness put in a table showing the duty to be obtained from 16-candle coal gas supplied by the Gaslight and Coke Company with the best classes of burner. The candle-units per cubic foot obtained were: Incandescent high pressure, 30 to 35; incandescent Kern, 20 to 25; incandescent ordinary, 14 to 19; regenerative, 7 to 10; standard argand, 3·20; ordinary argand, 2·90; flat flame No. 7, 2·44; No. 6, 2·15; No. 5, 1·87; No. 4, 1·74; No. 3, 1·63; No. 2, 1·22; No. 1, 0·85; No. 0, 0·59. He also drew attention to the enormous strides gas is making in displacing steam for power purposes; following this up by expressing the view that the best interests of the consumer lay in the direction of reducing the price of gas, and taking little or no note of what has up to the present time been the main factor—that is, illuminating value, as this was now secured even with the poorest gas by the incandescent mantle.

This brought witness to the statement of his opinion that London should have a uniform gas supply of 12-candle power coal gas, having a heating value of not less than 500 British thermal units gross. This would still give, with proper flat-flame burners, a reasonable amount of light to those who insisted on retaining these burners; while the diminution in heating value of the gas would be more than met by the reduction in price which was rendered possible. The importance of gas for fuel purposes in a city like London was emphasized. In the small area of the City, he stated there were more than 1500 gas-engines at work; while the number in the whole of London was not far short of 10,000. As to the calorific value of gas, the 16-candle coal gas as supplied to London had an average thermal value of 620 units per cubic foot; while the 12-candle gas would probably average 520 to 530 units. But the heating value of gas of given lighting power varied considerably with the class of coal from which it was made, as calorific value was entirely dependent upon the composition of the gas. In a gas in which the candle power was dependent upon a large proportion of methane, and very little unsaturated hydrocarbons, each candle of illuminating power would make a considerable alteration in the heating value; while if the illuminating power was dependent upon benzine vapour, 1 candle power made a very small difference in heating value. Therefore, in order to give sufficient latitude to the gas companies in their choice of the most economically usable coal for their purposes, he should advise the calorific value of the gas being defined as not less than 500 British thermal units gross, as determined in such reliable

forms of gas calorimeter as the Junkers or Simmance-Abady. There was very little doubt that it was flame temperature, and not the calorific value of the gas itself, which governed the light obtainable from an incandescent mantle; and, as was well known, the flame temperature given by water gas, which had only 320 British thermal units (gross thermal value), was greater than the flame temperature of coal gas of double that calorific value. With proper adjustment, he had obtained just as high an illuminating value from a Welsbach mantle with water gas as from coal gas; so that it was evident that the difference of 100 British thermal units, which would be the greatest probable loss, was practically negligible as regards its lighting effect when used with mantles.

In considering what economies could be made in the manufacture of coal gas, witness said it had always appeared to him that the regulations under which the London Companies worked with regard to purity had far exceeded the necessities of the case. It seemed to him that very great relief could be afforded to the companies, and a reduction of at least ½d. could be effected per 1000 cubic feet in the manufacturing cost of the gas, if purification by oxide of iron were reverted to in place of lime purification for sulphuretted hydrogen; and that this, although it might allow an increase in sulphur compounds other than sulphuretted hydrogen, would only do so to an extent that would be perfectly harmless to the consumer, while it would rid the neighbourhood of the gas-works of the intolerable nuisance inseparable from the use of lime purification for sulphur compounds.

Following these points, witness discussed the difficult question as to the allowances that should be made in the price of gas to the consumer in exchange for any alteration in parliamentary rights. In his opinion, the only satisfactory basis on which this could be done was to take the price which the gas cost in the holder, and see the actual economies which the alterations enabled the company to make in its manufacture. In London, 16-candle gas as at present made, stored in the holders, cost 1s. 2d. to 1s. 3d. The ordinary grades of coal carbonized yielded a gas of about 14 candles. While cannel enrichment cost 2d. a candle, the methods that had taken its place cost a shade under ½d.; and ½d. a candle was the utmost a company could be fairly asked to give up per candle for a reduction of illuminating power. If lime purification were abolished, and oxide of iron substituted, another ½d. per 1000 cubic feet would be saved; and if the full reduction in cost were given to the public it would leave the fixed charge on the company unchanged —that was, it would benefit the public without altering the financial position of the company. It would mean a reduction in price of 2½d. per 1000 cubic feet in the Gaslight and Coke Company's district, and of 1¾d. in the Commercial and South Metropolitan districts.

The question of testing for illuminating power and purity was next attacked; and witness was strongly of opinion that the tests were now so overladen with scientific details as to need revision on broad lines in order to make them of sound commercial utility. He explained how the consumers were safeguarded in respect of illuminating power in London; but as to the portable photometer, he advanced the deliberate view that to hold a gas company responsible for the illuminating power after the gas had left the company's control, was neither just nor in keeping with the meaning of the existing Gas Acts. Witness here made an important suggestion. It appeared to him that the whole *régime* of gas testing could be very much simplified, and made far more effective, if, instead of twenty-three testing stations being spread in different parts of London, a testing-station were placed upon the distributing mains as they left the works. Then, instead of taking three tests for illuminating power per twenty-four hours, with gas drawn from the mains, an automatic bye-pass should take 4 cubic feet an hour from the main into a small holder attached to the testing-station; and this gas would then represent the true average. This supply should be tested for illuminating power, heating value, and purity; and would prove a far more valuable check upon the quality of the gas sent out to the consumer than the present system did. With the reduction in candle power which was now rapidly taking place, it would be absolutely necessary to either provide new standard burners for each class of gas, or else to burn the gas at such a rate as to enable the burner to fulfil its proper function of developing the maximum illuminating effect from the gas. With gas of low illuminating power (say, from 12 to 14 candles), and with the "London" argand, there was trouble from over-aëration if the 5 cubic feet rate was adhered to. A gas which, when tested under natural conditions—that was to say, burned at such a rate as to give its maximum illuminating value, and the candle power per 5 cubic feet then calculated from the rate of flow—gave 12 candles, would often, when tested at the 5 cubic feet rate, give a light of not more than 8 candles; while, if a special burner were constructed, in which the air supply was graduated to the quality of the gas, 12 candles could be obtained at the 5 cubic feet rate. He was strongly of opinion that any photometric method adopted should be one which should properly and accurately give the true illuminating value of the gas, and that the relation between the commercial value and the illuminating power be treated as an entirely separate subject. As to the test for sulphuretted hydrogen, this was at present absurdly stringent; and if a fair sample of gas could be collected for testing at the outlet of the works in the way suggested, it would be quite sufficient to pass the flow of this gas through a cylinder containing lead paper during the period of testing for illuminating and calorific value.

Questioned by different members of the Committee, witness was taken over various matters advanced in the foregoing. Among other things, he pointed to the great reduction that had taken place in the price of mantles—excellent ones now being purchased at 3s. a dozen. As to the supply of gas for motive power, in Germany gas engines were being used to an extent that was simply surprising; and he did not hesitate to say that steam as a motive power was practically dead in that country. He was at some very big works in Frankfort a few weeks previously; and there the whole of the power was from gas-engines. They were getting 100-horse power for ten hours at under 10s., which is a price that could not be touched by steam. Taken again to the question of 12-candle power gas, among his remarks was one that the general impression when one went into a town where the gas was of low lighting power was not at all against the lighting of the town. One of the most striking instances that could be obtained was by observing the lighting of (say) Edinburgh, London, and Paris. Going through the streets, one would say that Paris was far and away the best lighted, London the next, while Edinburgh was terribly badly lighted. Yet in Edinburgh the gas was of 24 or 26 candle power; in the largest portion of London, 16-candle power; while in Paris it was 14-candle power. The deficiency in quality was made up by using more gas and also by adopting better methods of burning. As to the calorific power, there was not the least doubt that it would be the great value of the gas rather than the illuminating power. Mr. King put the question: Suppose the gas was to be made of 12-candle illuminating power, would there be any doubt or uncertainty in obtaining the 500 British thermal units?" Witness replied: "Not the least, if it was made from coal. The object of putting that limit to it would be to prevent too large a proportion of water gas getting in." The heating power of coal gas, he added, was very largely dependent on the proportion of methane (or marsh gas) in it. It really did not matter very much whether they had a poor coal gas or a rich coal gas, there was very little variation in the quantity of methane, because as the retorts were heated up the things that really broke up were the unsaturated hydrocarbons. The methane would stand a much higher temperature; so that the reduction in methane was not so great as in the other hydrocarbons, and the candle power came down more quickly than the heating power. All the 12-candle coal gases he had tested had run to about 520 British thermal units. As to enrichment, he found that 1-candle power obtained from benzol only brought up the heating value by some 22 thermal units; and about 20-candle carburetted water gas was only equivalent to 16-candle coal gas in heating value.

Considerable examination ensued on the question of purification. Taking coal gas as it came from the retorts, witness said that, according to the class of coal used, it contained between 300 and 400 grains of sulphur per 100 cubic feet. By the employment of oxide of iron, 90 to 95 per cent. of the sulphur present was extracted—leaving only 30 to 42 grains of compounds other than sulphuretted hydrogen. To go to considerable expense to get out a small proportion of this remaining quantity, was not a commercial operation; and, in addition, there was the nuisance. The method of stating the amount of sulphur, too, was apt to mislead one. To the lay mind, to speak of 40 grains of sulphur per 100 cubic feet, suggested there was a great deal present; but when it was worked out on the percentage, it came well into the third place of decimals. Whether the sulphur was 20, 30, or 40 grains, would make no practical difference to the consumer. Witness gave an account of experiments made at Greenwich with dust gathered from his study in which gas was burning practically eight hours a day, and with dust from rooms which dated back to King Charles's time, which had never been swept, and in which (or under which) no gas of any kind had been burned. In the gasless dust, there was 4·4 per cent. of sulphates; in the dust from his room, there was 3·08 per cent. of sulphates. This did not look as if the sulphur in the gas had any very great effect upon it. Another point bearing upon the matter was that now with incandescent burners, only 3¾ to 4 cubic feet of gas were burned, as against 6 to 9 cubic feet in the old flat-flame burners; and fewer of the former burners would be used as compared with the latter. So that in a room with gas simply purified by oxide of iron, there would be no more sulphur present than in the old days when purifying down to the limit of 22 grains. As to sulphuretted hydrogen, there was not the slightest necessity for allowing a single grain per 100 cubic feet of gas. Then, again, water gas contained sulphur almost entirely in the form of sulphuretted hydrogen, which would be entirely removed by oxide of iron purification; so that in places where one-third or one-quarter of the gas was carburetted water gas, the amount of sulphur compounds other than sulphuretted hydrogen would be lowered in the bulk of gas.

The well-known objections to portable photometers were stated by witness; but he admitted that with 12-candle power gas one of the objections against the use of such a photometer would be cleared away. Even, however, with 12-candle gas, one could not get an absolutely uniform supply all over a district. He rather expected that when the candle power was lowered, and an attempt was made to get 12-candle gas by increased temperatures, rather more naphthalene would be found in the gas. Returning once more to the question of testing, witness advocated the maintenance of the "London" argand; but his "private view" was that testing for illuminating power should be abolished entirely, and replaced by the calorimeter. Members of the Committee, however, appeared to be highly solicitous on behalf of those consumers who adhered to flat-flame burners, and of the prepayment consumers. For 12-candle power gas, witness said he should propose the use of a new argand specially adapted for that quality.

Fifth Day.—Monday, March 7.

At the opening of this sitting, Sir William Makins presented himself, and stated that if the Committee desired to see any of the works of the Gaslight and Coke Company, or to have any experiments made or checked, they would place their works and officers unreservedly at the disposal of the Committee. The Company would be glad to forward the inquiry in any way.

Mr. Corbet Woodall.

In his evidence in-chief, witness (who is a Director of the Gaslight and Coke Company) placed before the Committee some considerations respecting the history of gas testing in London. Proceeding, he stated that, while not objecting to the retention of the "London" argand No. 1 burner for the sake of uniformity, and because it was still entitled to be classed as a suitable consumer's burner for gas of about 16-candle power, the Company claimed that it should be used for testing purposes on the principle of burning the gas to the best advantage irrespective of the rate of flow of the gas—*i.e.*, the candle power should not be determined arbitrarily by a 5 cubic feet per hour consumption when a different rate of flow would give a better result per 5 cubic feet of gas consumed. The gas examiner should treat the test-burner as the consumer would do, by turning up the gas until he gets the most light, short of the smoking-point. It had been discovered since 1871

that the use of the "London" argand burner No. 1 (which was not, by the way, prescribed in the Gas-Works Clauses Act as Mr. Harcourt appeared to think), by the procedure enacted by that statute, was unfair to the gas when tested below 16-candle power. Many Provincial gas companies, by inadvertence, put this burner into their Private Acts for testing gas below 16 candles; but this was being corrected as fast as the companies came to Parliament. There was no such uniformity in the legal definitions of 14-candle gas throughout the country as Mr. Harcourt assumed; for Wandsworth and Brentford had always had the greater liberty, of which he (Mr. Harcourt) disapproved; and this liberty was now being extended as fast as Parliament had opportunity to legislate.

The position of the Gaslight and Coke Company in regard to the question of the illuminating power of their gas was, witness said, perfectly plain and logical. Illuminating power was a matter of value for money. The precise value of illuminating power at per candle was not well understood outside the gas industry. In 1900, the South Metropolitan Company relinquished, in consideration of a diminution of their illuminating power from 16 to 14 candles, as tested by the improved method (which, according to the evidence, practically made the reduction about 3 candles), 2d. per 1000 cubic feet on their standard price. This was paying too dearly for the illuminating power standard. Actually the change had only showed a saving to the Company of about ⅛d. per candle. The Gaslight and Coke Company's figures corroborated this valuation; their enrichment being by carburetted water gas, which was better for the purpose than either petroleum spirit or benzol, and cost less than ½d. per candle. When the Gaslight Company went to Parliament last year, they did not propose to reduce the illuminating power of their gas, for the reason that they could not admit the same exaggerated valuation for the difference; and they did not believe that, in their case, 14-candle gas would have been so useful generally as the 16-candle gas they now supplied. Had the contrary been their opinion, they would not have hesitated to ask Parliament to give them the relief of 2 or, in effect, 3 candles without penalizing them in the matter of price. If, as was sometimes claimed, 14-candle gas was as good for the consumer as 16-candle gas, there could be no justification for reducing the standard price for it, and the sliding scale might be trusted to equitably share out the increased profit (if any) of supplying the lower-grade article. But this was not so. There was a difference in value; and it seemed reasonable that the consumer should have a fair allowance in respect of it. The Gaslight and Coke Company, however, could not afford to make more than a very slight abatement from the selling price, because the saving they could effect was so small. They made a large proportion of water gas; and it was their experience that the mixture they made—which was normally one to three of carburetted water gas and coal gas respectively—was quite as cheap to manufacture as would be a coal gas of about 14½-candle power. Taking into account the fact that coal was not used in the manufacture of carburetted water gas, while there was a large user of gas coke, an incidental economy was found in keeping down the cost of coal and maintaining that of coke to the advantage of the coal gas manufacture. The Company could not at present fulfil their statutory obligations to supply 16-candle gas to the whole of their immense district without the help of carburetted water gas. Further, the admixture now being supplied was, in their experience, the best in value they could give to the consumers. Should, however, the supply of oil fail, or from any other cause its price be greatly enhanced, they might be driven back upon coal only; and then they would not hesitate to ask from Parliament such aid as would attach to a reduction of the standard of illuminating power.

Professor Lewes had advocated a uniform gas supply of 12-candle power, having a heating value of not less than 500 units gross. He had also given the calorific value of London 16-candle gas as 620 British thermal units. The reduction, then, was 120 units, or 19·3 per cent. To compensate the consumer for this reduction, so that he would get as much for his money as he did at the present time, it would be necessary for the Company to make a reduction of 6·95d. per 1000 cubic feet, at the present selling price of 3s. This they could not afford to do. They could not even afford to make a reduction of 3d. While it was true that the incandescent effect in a mantle depended upon the flame temperature, it was equally dependent upon the calorific power. Assuming the flame temperature to remain constant, the amount of light obtained from a given volume of gas was proportional to its calorific power. On present prices, the Company could only see their way to save, by the alteration of illuminating power, ¾d. per 1000 cubic feet in the cost of manufacture, which, on the price of 3s. per 1000 feet, was but 2½ per cent. An enforced reduction of the illuminating power would therefore be, at least, premature.

Reverting to the question of testing, witness suggested that the use of the improved table photometer, with adjustable distances of the test-burner from the photoped, should be sanctioned, as this would enable the gas to be burned in the test-burner to the fullest advantage, whatever its quality; and thus the true corrected illuminating power calculated from the standard rate of consumption could be ascertained with perfect fairness. This would be quite satisfactory, and agreeable to the true intention of Parliament. No alteration of the law would therefore be required to sanction it.

On the subject of testing for sulphuretted hydrogen, witness regarded Mr. Vernon Harcourt's evidence as very fair. He suggested, however, that some means of avoiding penal proceedings in respect to the presence of this impurity at a testing-station should be open, where it could be shown that the defect was traceable to some local deposit in the service-pipe decomposing under some alteration of condition, and giving up the sulphuretted hydrogen to gas which did not previously exhibit it. As regarded the purification of gas from sulphur compounds, the Company would wish to keep their gas as pure as it was industrially possible to make it. In the face of the trade competition to which they were now exposed, in connection with which the bogey of "fumes" was always made the most of, it was plainly the Company's business to give no cause of offence to their customers. It was not the cost, nor the trouble of what was called sulphur purification, to which the Company took exception; but the process involved required the removal of spent lime from the purifiers in a condition very offensive, and even hazardous to the men employed. It also created an offence in the works, and to the neighbourhood where they were situated, as well as along the routes by which the material was conveyed. This great local, concentrated nuisance ought to be weighed against the diffused, problematical, and, in any case, slight cause of offence which had never been reduced to a concrete proof, or measured.

Witness was questioned at some length on all the foregoing matters. He considered that having different standard burners for different qualities of gas, would be an inconvenience, seeing that the "London" argand—the one only standard burner—was available with variations in consumption. A number of experiments made in preparation for an application by the Company to Parliament last year showed that the consumer would lose about 25 to 30 per cent. when the gas was burnt in flat-flame burners by the reduction from 16 to 14 candles. And, again, it was observed from a large number of experiments that there would be an increased duty obtained from an incandescent burner if a high-quality rather than a low-quality gas were used. If a reduction to the 14-candle standard was forced upon the Company, they estimated that the economies they would be able to effect would only amount to ⅜d. per candle. For 2 candles, they would see their way to saving ¾d. per 1000 cubic feet. The loss in the flat flame burner would be, as he had said, some 25 to 30 per cent.; the loss in incandescent effect would be about 15 per cent.; and the loss in calorific value would be more nearly 7 per cent. than 6 per cent. The Company made 14½ to 15 candle gas from coal, and brought it up by carburetted water gas to about 16½ candles; so that the average quality of the water gas would be from 20 to 23 candles. The quantity of carburetted water gas that was now being made in Great Britain represented something like 1½ to 2 million tons of coal, which was saved from consumption. From the point of view of calorific value, carburetted water gas was inferior to ordinary gas; but the calorific value of the mixture was very little lower. In fact, the carburetted water gas the Company were using, which was a little over 20 candles, was equal in value to the gas made from coal. Although he did not want to criticize the other Companies, it was decidedly his opinion that they had made a mistake, or a mistaken calculation, in reducing the quality of their gas. It had been stated very distinctly from the point of view of the South Metropolitan Company that they could not save in manufacture the 2d. per 1000 cubic feet which they had taken off the price of gas as the equivalent of the 2 candles. On the other hand, not only had they not given too much for it, but, if the figures the Gaslight Company submitted were correct, the South Metropolitan Company had given too little. In other words, he thought that both the Company and the public had lost by the change. In regard to prepayment installations, in some of the Continental works to which he was adviser they gave an incandescent burner, and found it worked very well. The mantles were provided by the companies in the first instance; but the consumers had to renew them. He did not know of any company in this country who did this; and practically all flat-flame burners were used.

Witness was questioned again on the subject of purification; and one of the remarks of the Chairman in this connection was that all the evidence so far had been in the direction of showing that the test for sulphuretted hydrogen was unnecessarily severe. There was a little discussion here as to the gas companies being haled before the Magistrates for slight offences; and it was suggested by Mr. Trewby that a civil action for damages would be preferable to the penalty for criminal negligence.

Mr. G. C. Trewby.

The evidence-in-chief of this witness (who succeeded Mr. Woodall in the chair) opened with a statement as to the manner in which the district of the Gaslight and Coke Company is supplied. Passing to the subjects immediately before the Committee, he stated that a staff of men are kept employed, in relays every eight hours, to test the quality and purity of the gas; and the gas is not allowed to leave the works without being well above 16 candles. Enrichment at Beckton, Bromley, Nine Elms, Fulham, and Kensal Green consists of carburetted water gas; at the other stations, cannel and petroleum spirit to a small extent are used. He traced the history of testing for illuminating power from the Act of 1868 down to the present time, and described the care that was taken in fitting up the sixteen testing-stations in the district—comparing the condition of things existing there with the uncertain conditions surrounding the portable photometer. Returning to the question of carburetted water gas manufacture, he stated that the Company's plant was equal to a production of 25,000,000 cubic feet out of a total manufacturing power of 136,665,000 cubic feet. The percentages used run between 17 and 33. The average annual cost per gallon of oil used had been as follows: 1893, 3·10d.; 1894, 2·69d.; 1895, 2·71d.; 1896, 2·92d.; 1897, 2·80d.; 1898, 2·15d.; 1899, 2·51d.; 1900, 3·68d.; 1901, 4·43d.; 1902, 2·92d.; 1903, 2·16d. Excluding 1901 as an abnormal year, the average price of oil over the nine years came to 2·34d. per gallon, which showed that the cost at Beckton for making 16 5-candle gas came out at 13·57d. per 1000 cubic feet, and the calculated cost on the same basis for 14·5-candle gas would be 12·83d., or a reduction of 0·74d. per 1000 cubic feet for the 2 candles. This was about the average amount the Company would save if they had to supply the reduced illuminating power. The actual cost of the gas made at Beckton last year, based on oil at 2·31d. per gallon, was 13·25d. per 1000 cubic feet; and the estimated cost of making 14·5-candle gas was 12·64d.—showing a difference of 0·61d. per 1000 cubic feet. Thus, taking all this into consideration, ¾d. per 1000 cubic feet was about the saving the Company would effect by coming down 2 candles. Having spent a large amount of money on this plant, if a lower illuminating power was forced upon the Company they would have to make carburetted water gas of a much lower candle power to mix with the coal gas, which mixture would have a much lower calorific power.

Witness stated that a mixture of two-thirds coal gas and one-third carburetted water gas—the former having an illuminating power of about 15½ candles, equalled 570 net Board of Trade units, and the latter, about 19 candles, equalled 555 net Board of Trade units—gave a light of 16½ candles, and had a heating value equal to 565 net Board

of Trade units, or 34·24 net Board of Trade units per candle. If the illuminating power was dropped to a minimum of 14 candles, the calorific value of 14½ candles would be about 528 Board of Trade units, or a reduction of 37 units—equalling 6·55 per cent. Therefore for luminous burners 14·3 per cent. more gas would have to be used, and for heating 7 per cent. more. The utmost saving the Company could make would, as he had stated, be about ¾d. per 1000 cubic feet. Therefore, the present price being 3s. per 1000 cubic feet, the consumer would pay 2s. 11¼d. To get the same light that he had before on the rule-of-three basis, he would require to burn one-seventh more, which would be equal to 5d.—making the cost to him 3s. 4¼d. So that the consumer would be a loser to the extent of 4½d. per 1000 cubic feet. As to Welsbach burners, the difference in the calorific intensity between 16½ and 14½ candle gas was found, by experiment, to be about 10 per cent. This would mean that, to obtain the same amount of light, the consumer must use 1100 cubic feet of 14½-candle gas, as against 1000 feet of 16½ candle gas; and it would cost him 3½d. more. With reference to gas used for cooking and heating-stoves and gas-engines, 7 per cent. more would mean that the consumer would be out of pocket to the extent of 2·46d. per 1000 cubic feet.

So far as the Company's oil-gas manufacturing plant was concerned (which had been designed to manufacture gas from 20 to 25 candle power in the most economical manner), the output of the apparatus would be reduced to the extent of about 8 per cent., or 2 million cubic feet per diem, necessitating further expenditure for manufacturing power. With regard to the distribution system, the mains would be taxed to a greater extent in order to convey the same amount of heating value; and this would have to be met by either working at higher pressures or increasing the capacity of the mains. His firm opinion was that the greater the number of candles or heat units per cubic foot of gas that could be conveyed along the mains—provided the comparative cost between high and low power gas was the same—the better it was for all parties concerned; and, as he had shown, at the present time the richer gas was cheaper light for light or heat for heat than the poorer gas. So far as the South Metropolitan Gas Company were concerned, they had not any carburetted water-gas plant; and they had a special reason for getting rid of the obligation to supply 16-candle gas all over their district. He believed the consideration that led to the reduction in the case of the Commercial Company was fear that the price of oil might go up, and so do away with the saving previously effected.

The next part of Mr. Trewby's statement referred to the testing of gas. He went into a minute description of the present methods, and then submitted a suggestion. In order, he said, to bring about approximate equality between coal gas and a mixture of coal gas and carburetted water gas, or, in other words, to put them on an equal footing, the gas in all three cases should be set to burn to a height of from 3 to 3½ inches above the top of the steatite ring of the argand burner. This system, if applied to all three Companies, would place them on an equal footing, and would carry out the evident intention of the Legislature—viz., the burning of the gas to its best advantage in the standard burner. In order to test gas with a fixed height of flame, all that was necessary was that the gas pillar should be made to slide beyond the 16-candle position until equality of light was obtained on the photoped, when the illuminating power could be read off on the scale attached to the micrometer movement of the gas standard; and then the necessary calculations could be made reducing the consumption down to a 5-foot rate as at present. In order to facilitate this, a table could be used, which would give the illuminating power at a glance. It was most important that the same standard burner, chimney, and photometer should be employed to test the gas of the three London Companies, as comparisons were frequently made both as to quality and price. At the present time, the Gaslight and Coke Company were supplying gas all over their district—not 2 candles more as the public supposed, but nearly 3 candles, by reason of the method of testing in use by the other two Companies, that being much more favourable to their gas than the one prescribed for testing the gas of the Gaslight and Coke Company. In order to check the system proposed, he had had a series of tests made on the oil gas alone, on the coal gas, and then on the mixed gases with the same burner; and he found the result agreed very closely with the theoretical result deduced from the illuminating power of the mixed gases. He agreed that the test for sulphuretted hydrogen as now carried on was extremely severe, especially as it was impossible to purify gas so that there should not be a trace of sulphuretted hydrogen present. The suggestion was that the test for sulphuretted hydrogen should be either confined to a smaller quantity of gas—say, 1 cubic foot—or (which would be far better) that the test should be made quantitative. The Company also thought that if the whole of the sulphur compounds other than sulphuretted hydrogen were left in the gas—say, 40 grains—the effect on the air of the room by the combustion of the gas when used with the incandescent mantle would be inappreciable. At the Company's works, sulphur purification was a matter of considerable nuisance; but its absence would not effect any appreciable economy in manufacture—this being at the most 0 1d. per 1000 cubic feet of gas made. He commented upon the uncertainties and anxieties attending purification.

Another suggestion Mr. Trewby made was that where there were several testing-stations in a district using the same gas, the average should be taken to represent the illuminating power for the day, with this exception—that if, at any one station, the gas was returned as below 15 candles, the return from that station should stand alone and be the subject of investigation. He thought the procedure in connection with testing required simplifying, so that the Company, if they felt aggrieved, might have an opportunity of being represented the day following the disputed tests. He considered, too, the Company should have an opportunity, through their officers, of making tests between those made by the examiner, and that they should endeavour to come to an agreement as to what was the correct illuminating power. Witness considered the existing procedure, by which a forfeiture was assessed and determined by a Magistrate, seemed unnecessary and objectionable; and the Company had long felt it to be an indignity and a hardship that they should be forced to appear in a police court in order to pay any forfeiture incurred. It was held that the amount of the fine could be better assessed by the Chief Gas Examiner, who had before him full evidence as to the alleged defects in the purity or illuminating power of the gas, and who was therefore best able to judge of the penalty which should be inflicted. Resort to the Chief Magistrate should only be had in the event of the Company refusing to pay the fine assessed by the Chief Gas Examiner. Witness suggested several alterations which in his opinion should be made in the Acts governing the testing of gas.

Questioned by the Committee, witness stated that the number of testing-stations in the Company's district in proportion to area and supply was much larger than in the case of the other Companies. He expounded again the objections to the portable photometer. He regarded very favourably Professor Lewes's proposal to take a continuous sample of gas into a holder as it passed from the works for testing; but he said he should like to experiment with it before expressing a definite opinion. If there was no deterioration of the gas standing in the holder, it would be perfectly practicable. He produced the figures of tests made of Beckton gas in 1902. At Beckton, the average illuminating power for the year was 16 49 candles; and at Tudor Street—8½ miles away—the average was 16·35 candles. So that there was only a difference of 0·14 candle. This gas contained carburetted water gas, and nothing was done to it from the time it left Beckton. When water gas was properly fixed, there was no deposition. Generally speaking, his examination at the hands of the Committee was an amplification of his evidence-in-chief, and did not produce any really new feature. He, however, insisted that all the Companies should be on the same footing, because at the present time the Gaslight and Coke Company give, not as the consumers believed 2 candles more, but nearly 3 candles more, than the other two Companies. "Would," asked the Chairman, "your purposes be equally answered by their gas being called 13 candles as by yours being called 17 candles?" "Then," answered witness, "there would be 4 candles difference." In order, he added, to bring the Companies all on to the same terms, they should all be rated by the same burner and apparatus. He thought the quantitative test for sulphuretted hydrogen, and the 1 grain per 1000 cubic feet of gas as suggested by Mr. Vernon Harcourt, was the right thing. Although the cost of purifying for sulphur compounds was so small, his objection was the difficulty of complying with the obligation and the nuisance occasioned.

Sixth Day.—Tuesday, March 8.

Mr. H. E. Jones.

On being called before the Committee, Mr. H. E. Jones explained that his Company (the Commercial Gas Company) were acutely concerned with the inquiry, because they had got a Bill hung up for the purpose of determining how the gas should be tested for illuminating power. In the course of the statement handed in by him, witness said he believed that, since the introduction of the Welsbach system of lighting, the interest of the consumers and the public generally was almost entirely in the heating power of gas. There was a large and rapidly growing demand by all classes, including the poorest, for gas for cooking and heating, as well as lighting, and in industrial localities an extensive demand for trade uses and power. For the purpose of meeting the latter want, the Commercial Company had granted a discount of 20 per cent. to gas-engine users. A similar discount was allowed by the Wandsworth and Putney Gas Company; while even a small town like Uxbridge offered a still greater concession, and the European Gas Company, in France, gave varying discounts averaging fully 20 per cent. The larger proportion of gas burnt in the summer by prepayment consumers, showed the chief use to be for cooking.

On the subject of the cheapening of gas by "14-candle companies," witness remarked that he had always (by comparison with outside undertakings having a standard of 14 candles or less) regretted the obligation on the Commercial Gas Company, from 1875 onwards, to supply 16-candle gas, because in spite of every temptation of a higher dividend attaching to reductions in price, the cost of enrichment largely defeated the efforts which in other districts were successful. To illustrate the more rapid fall of price that had taken place under the lower illuminating power, he produced a table giving the charges for gas in various places in the years 1880 and 1904. This showed that, within the period named, there had been a reduction of 38 per cent. at Eastbourne, 38 per cent. at Wandsworth, 33 per cent. at Watford, 28 per per cent. at Margate, and 25 per cent. at Epsom. On the other hand, the Gaslight and Coke Company (with 16-candle gas) had only made a reduction of 5 per cent.; and the Commercial Gas Company (with 14-candle gas in 1903), of 16 per cent. The South Metropolitan Company, who had supplied 14-candle gas since 1900, were the only London Company who had accomplished any important reduction in price; the figure in their case being 26 per cent. Although the large reductions referred to had been accompanied by additions to dividends, the disposition of the local authorities in every instance had been to be contented with the cheaper gas, and the resultant economy in the public lighting. Among some twenty companies outside London who had for forty years been more or less under his attention, only one penalty—and that merely for defective illuminating power—had ever been enforced. The Companies knew the requirements of the consumers, and that therein lay their best interest; but in London the County Council were ever seeking to cripple the Companies with suggestions which, instead of meeting the public requirements, obstructed them.

Turning to the Commercial Gas Company, witness said that when they went to Parliament in 1902, he strongly urged that the illuminating power should be reduced, even at a surrender of 2d. per 1000 cubic feet in the standard price; and no sooner did the measure become law, than a corresponding reduction in the actual price was made by the Company. Owing, however, to the Referees taking a different view of the effects of the various Acts relating to the Company to that which was in the mind of the Directors, after notice of the reduction in price had been given, a prescription was issued by the Referees enforcing the combustion of 5 cubic feet of 14-candle gas per hour in the standard burner which had previously been used for a like quantity of 16-candle gas. Under these circumstances, it had been found that, so far from a corresponding economy in manufacture to that which had

been contemplated in the reduction in price, the saving was only a little over ½d. per 1000 cubic feet. The Bill referred to had been framed on the lines of the South Metropolitan Act of 1900, not only for the sake of precedent, but because the actual experience of that Company was relied upon to justify the large concession in price by the Commercial Company. He was satisfied that the system prescribed by the South Metropolitan Act was a fair method of testing gas, because unless sufficient gas was passed through the burner to bring the carbon up to the equivalent of the air supply of the burner, the gas was, so to speak, over-burnt, and did not develop its normal illuminating value. This could be illustrated in two ways—first, by checking the chimney action upon the burner by discs; and, secondly, by regulating the air supply by an adjustable cone in the base of the burner. In view of the difficulty which had arisen, the Commercial Gas Company promoted a second Bill in 1903; but this was passed for a period of three years only, as the County Council intervened with the suggestion that an inquiry of the kind now being held should take place.

As an alternative to the method of burning the extra volume of weaker gas in the burner intended for a richer quality, witness was prepared to accept as a test burner an argand such as was employed somewhat extensively outside London, designed by Mr. Sugg for use with 14-candle gas. The burner had been employed for many years by the Wandsworth and Putney Gas Company and the Brentford Gas Company; and it conformed to the very old-standing parliamentary description—"a fifteen-hole argand, to be used with a 7 inch chimney." It was quite a common form of burner, and corresponded with another which had for some years been in use by witness at his private office, but which was intended for a larger consumption than 5 cubic feet per hour. It could be readily purchased at a price placing it within the reach of any ordinary consumer who might be so unwise as not to prefer the Welsbach burner. If it was desired to limit the volume of gas used in the test to 5 feet per hour, the Wandsworth and Brentford burner must have different airways to the 16-candle "London" argand, or it would not be an efficient burner for the quality. With this necessary condition, however, the burner was perfectly fair and reasonable, having regard to the consumers' interests. There was nothing complicated or special about it, or essentially different to the consumers' burner referred to as having been in use in his office. Surely, he said, no burner could be neglected because it was an efficient burner. It was impossible that anything in the form of the burner could add to the constitution of the gas consumed in it; it could but educe the light by importing favourable conditions. Of course, any burner to be used for testing under penalty must be made with care, and its dimensions so gauged as to secure accord between different operators working at different photometers. But with this safeguard, the burner was an ordinary one. In this connection, it was desirable to remember what the original enactment of 1868 (section 43) was as to the burner to be employed—namely, that it should be the most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer.

Coming to the point of purification, witness said the impurity known as bisulphide of carbon was admitted by the Referees to be practically incapable of entire removal; and their prescriptions had not gone beyond the modification of the amount from the normal, which would average 35 grains, down to an average of 20 grains—or a diminution of fifteen-thirty-fifths. The Welsbach system of lighting had the practical result, by diminishing the volume of gas required to be burnt, of modifying its effect on the atmosphere of a room where it was burnt, by the difference between 20 cubic feet and 3 cubic feet, or (say) by seventeen-twentieths, as against fifteen-thirty-fifths. The reduction of the bisulphide of carbon was attended with great liability to fluctuations from the lime becoming, as it were, a magazine of accumulated sulphur in a combination which was very unstable. But what was most harassing of all, it necessitated in any system of purifiers that the sulphuretted hydrogen from the gas should be present in large excess at the penultimate purifying vessel; so that the risk of faint stains of sulphuretted hydrogen was greater on a gas-works employing bisulphide purification than on one where the sulphuretted hydrogen could be removed by oxide of iron. As to sulphuretted hydrogen, if the presence of 20 grains of bisulphide of carbon was a tolerable position (as it must be by the Referees' own prescription), then the presence of a one-hundred-thousandth part of a grain of sulphur as sulphuretted hydrogen per 100 cubic feet—especially with such a risky process, ought not to carry the severe penalties which it did.

Witness concluded his statement by pointing out that the institution of the Referees and Chief Gas Examiner was originally the suggestion of the Companies themselves, who agreed to accept at the same time a large increase in the illuminating power and a condition of purification which up to then had never been practised.

The first matter with regard to which Mr. Jones was questioned by the Committee was the relative importance of the lighting and heating power of gas. He said they might certainly look forward to the time when the flat-flame burner would be altogether superseded—more especially as an incandescent burner, with chimney and all complete, could now be obtained for 9d. When reducing the illuminating power, the Commercial Company were put under the obligation of supplying a good batswing burner costing about 4½d.; and they were now considering the advisability of putting in for the prepayment consumers instead an incandescent burner of the kind he had mentioned—in some cases, indeed, they had actually carried out the idea. The consumers could get mantles for these burners from the Company's fittings department at 3d. each. The Company had started a maintenance system for the ordinary consumers; but they had no contract of this kind with the users of prepayment meters, who were not yet as a class so well acquainted with the usage required by the mantles. Asked by Dr. Farquharson what he considered the life of a mantle, with fair wear and tear, witness replied in his own house six months, and in a street lamp about two months. In a workman's house, he could not say; but the consumers on contract, he thought, used six or eight mantles a year, of which a large proportion were broken by accident.

Subsequently, witness remarked that he was an advocate not so much for the lower quality of gas as of the lower price. He had been constantly pressing for cheap gas everywhere; and it could not be made cheap if expensive artificial enrichers had to be employed. The Chairman pointed out that the Committee had had it before them in evidence that 2 candles cost less than 1d.; but witness replied that this was just because Mr. Rockefeller chose to allow oil to come to this country at the present time at 2d. a gallon. He had, however, known it to be 5d., and the difference between oil gas and water gas enrichment and the other gas to be many pence when the initial cost of the oil was greater. It took roughly for enriching purposes 3 gallons of oil to make 1000 cubic feet of gas. If the oil was 2d per gallon, this meant 6d. per 1000 feet; but if it happened to be 6d. a gallon, the cost of the gas would be 1s. 6d. per 1000 feet. A water-gas plant was an extremely useful adjunct to a gas-works; but he had never for a moment supposed that it was the best way of making gas. He had used water gas considerably; but it was obvious that where the supply of oil was in few hands it was impossible to depend upon the supply as one could upon coal. With oil at 2d. per gallon, and coke not too dear, it might be true that the cost of the 2 candles extra was not more than 1d.; but the average would be considerably above that. Then it was necessary to be very cautious about other expenses. There was a fashion of just charging this particular branch of manufacture the special cost upon it, and forgetting all the establishment cost connected with the upkeep of the undertaking, and also the very great cost of purification. The gas contained 2½ per cent. of carbonic acid, as against the 1 per cent. of ordinary gas. As an average, therefore, he thought that what had been put before the Committee (that 2 candles cost less than 1d.) was a very serious under-estimate.

As proof of this, witness referred to his statement that he advised the Commercial Company to surrender 2d. per 1000 cubic feet on their standard price to secure a reduction of 2 candles; and that this was done immediately. There were many considerations involved besides the illuminating power. There was the popularizing of the gas, and bringing it to a price at which a man who employed a large engine would use it. The only chance there was of their approaching the Mond gas and keeping it out of their district—in other words, avoiding the necessity of paralleling their mains, which would be a very costly and troublesome thing—was to give the consumer four times the power of Mond gas at four times the price. If they could give gas of 12 or 13 candle power, suitable for incandescent lighting, at 1s. 8d. per 1000 cubic feet, they would be well able to compete with Mond gas, which was much more. In proportion to its price, he maintained that the lower-quality gas was equal to the higher quality. He did not, of course, pretend that 12-candle gas had as much heating power as 14-candle gas. Naturally, the higher illuminating power gas had the higher heating power, but not so much higher as its cost of manufacture would seem to represent. Without the use of water gas (to which there were certain objections), the extra heat resident in the 2 or 3 candles of higher illuminating power would cost a great deal more than it is worth from the heating point of view.

Questioned by Mr. King, witness admitted it was a fact that, by the use of carburetted water gas, the price of the coke could be raised; but he said the total receipts were not greater, because a lot of the coke was absorbed. It simply meant, therefore, that by destroying a lot of coke and removing it from the market, the remainder was made more valuable; and this was not an economic argument that appealed to him—he would rather sell more coke at a slightly lower price. It was true that there were companies with whom coke had been a very great trouble, and hardly disposable of at any price; but this was partly through over-production in several localities, and partly through the operation of the prepayment meter system. In every house that the Commercial Company fitted up with cooking appliances, they displaced what was one of their best coke consumers. Coke was essentially the fuel of the working class, because, although not particularly cheap as compared with coal, it made a lasting and glowing fire. By the adoption of water gas, capital expenditure was saved on buildings, land, storage accommodation, &c., and there were also advantages with regard to labour, and the readiness with which emergencies could be met. There was, however, a drawback in the matter of the capital expenditure on mains. Water gas was so heavy that it handicapped the distributing system considerably; and if used in large percentages, it would mean either the employment of much higher pressures or the enlargement of the arterial mains. Therefore the economy in capital on the works, which he agreed was considerable—probably more than half in productive plant, apart from gasholders—was checkmated, or at any rate handicapped, by the disability placed on the mains in distributing such heavy gas. Statistics did not show any particular drawback to the use of a mixture of one-third water gas and two-thirds coal gas; but his own opinion was that 30 per cent. of water gas was a little high—he did not quite like it.

Having enlarged on the views contained in his statement with reference to the proper method of testing 14-candle gas, witness was taken to the subject of purification. He said he did not think that gas purified only from sulphuretted hydrogen would give rise to inconvenience from the presence of too much sulphurous acid. He had come across, in the "JOURNAL OF GAS LIGHTING" for 1869, the following statement of Dr. Odling bearing upon this matter: "To produce a cubic foot of sulphurous acid, would require an hour's combustion of 300 burners consuming 5 feet of gas apiece; while to have a cubic foot of sulphurous acid existing at any moment in the air of any room, of whatever size, would necessarily require a much more abundant gas consumption, owing to the great change of atmosphere taking place every moment, even in the worst ventilated room." This was, after all, only confirmatory of the very liberal evidence in that relation given by Mr. Boys and Mr. Vernon Harcourt. It showed that, on the hygienic side, there was no more to be said now than there was in 1869. The elimination of the carbonic acid from the gas was an essential thing. The Companies must therefore use lime; but the product from carbonate of lime was a very innocuous one. If they employed lime to remove the 1600 grains of carbonic acid per 100 cubic feet, it would be only necessary to use a little extra to eliminate the sulphur; so that the saving to the Companies by being relieved of this restriction would not be very great. The carbonic acid had a deteriorating effect on the gas, not only in regard to its illuminating power, but also as regarded its calorific power.

Sir William Abney asked witness on what, principally, he based the request to be relieved from the sulphur clauses, if it was not simply economy. Witness replied that it would mean economy in the number of purifiers needed, and therefore in the cost of plant. It would be found that the purifying plant of a gas-works adopting sulphur purification cost at least 25 per cent. more than that of a works having oxide of iron purification only. He should say the actual cost out of pocket, without interest on plant (which he had not worked out), would not be much more than ¼d. per 1000 cubic feet. Allowing about 1d. for taking out the whole of the carbonic acid and the sulphur, he thought they would require three-fourths of it for the carbonic acid. The anxiety and worry which the sulphur clauses imposed on the staff was very great; and sometimes those who were in any sort of responsible position broke down in health altogether under the strain. A great deal of the difficulty would be removed if the test related only to the average of the sulphur over a certain period of time; and he acknowledged with gratitude the concession recently made by the Referees in this direction. They had given the Companies a certain amount of latitude by stating in their last notification that, if a reasonable average was attained, this would suffice.

The Chairman remarked that witness had referred to the dislike which the Companies felt to being taken to a Police Court for the recovery of forfeitures; and he asked him whether he had any suggestion to make on this matter. Witness answered that he thought the best way of avoiding it was to make such reasonable regulations for the Companies to follow as would not involve this severe strain. For anything of a negligent character, he did not see that the Companies ought to expect to get away from an exposure; and there was no doubt that the object behind this provision was to expose any continued negligence on the part of the Companies. He did not think there would be much chance of the Companies going before the Magistrates if some of these extremely delicate edges of testing were taken off. He had no doubt the Chief Gas Examiner would be a much better assessor of penalties when a bad report was made than a Magistrate, because he would know the Company's circumstances. Further questioned by the Chairman, witness said he quite agreed it would be better that the Chief Gas Examiner, in deciding appeals, should review the cases rather on their merits than having regard merely to technicalities. He did not think he ever advised his Company to take any objection that was not distinctly on merits—except in one case, which led to the Sunday testing dispute. The Act said three "consecutive" days; and the point was that Friday, Saturday, and Monday were not three consecutive days, because Sunday intervened. The Company thought their staff might at least have one day a week to themselves.

NEXT YEAR'S EXAMINATIONS IN GAS MANUFACTURE.

The Question Papers.

We have received from Mr. John Murray, of Albemarle Street, W., the programme of the Department of Technology of the City and Guilds of London Institute for the session 1904-5. We learn from it that examinations in "Gas Manufacture" next year will be held on Saturday, the 29th of April, and that they will include questions founded on such subjects as the following.

ORDINARY GRADE.

(1) The construction of a retort or oven best adapted for the destructive distillation of coal. (2) The setting of retorts, and the construction of retort-furnaces. (3) The effects of temperature in modifying the quantity and quality of gas produced. (4) The description and arrangement of apparatus employed for the conveyance of gas immediately upon its leaving the retorts. (5) Apparatus best adapted for cooling the gas, and for removing the products of condensation. (6) The methods of removing the gaseous impurities from the cooled gas, including a description of the materials employed, and the most suitable condition of the gas for effective purification. (7) The use of an exhauster. (8) The methods employed for controlling the pressure at the works, so as to secure an adequate supply of gas at the various points of consumption with a due regard for economical effect. (9) The various instruments used in gas-works for ascertaining and recording pressure and exhaust. (10) The laying of main and service pipes. (11) The construction and fixing of gas-meters, and the fitting up of premises for the supply of gas. (12) The various forms of gas-burners in general use. (13) The simplest methods of ascertaining the illuminating power of gas. (14) The simpler physical and chemical principles involved in the various processes of gas manufacture and in the tests for ascertaining the illuminating power and purity of the gas and the value of the bye-products. (15) The practical method of carrying out these tests. (16) Influence of temperature and pressure on the volume of the gas.

HONOURS GRADE.

In the Honours examination, more difficult questions will be set in the above subjects; and, in addition, a knowledge will be required of—(1) The characteristic properties of the various kinds of coal, and their value for gas-making purposes. (2) The effects of temperature upon the production of residuals. (3) The chemical composition of coal gas, and the effect of each component upon the illuminating and calorific power of the gas. (4) The principles of combustion, and their application to the working of retort-furnaces. (5) The more advanced physical and chemical principles involved in the processes of destructive distillation of coal, and in the condensation and purification of the resulting gas. (6) The methods of gas analysis, including those for ascertaining the amount of impurities in the crude gas. (7) The practice of photometry, and the determination of the calorific power of gas. (8) The best means of burning the gas in order to develop its illuminating power to the greatest advantage. (9) Labour-saving appliances in the retort-house, and the working of retorts. (10) The construction of gasholders, purifiers, and other gas apparatus. (11) The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working. (12) The method of dealing with such emergencies as are of more common occurrence in gas-works through breakdown of machinery or other failure of plant. (13) The working up of ammoniacal liquor. (14) The manufacture and purification of uncarburetted and carburetted water gas. (15) Methods of enrichment of coal gas by means of oil, &c. (16) Such important recent developments of the gas industry as have been fully described in the Technical Press.

Certificates are awarded on the results of each examination; but for the full technological certificate the candidate must also qualify according to the rules. The questions set at the last examinations were given in the "JOURNAL" for the 10th of May (*ante*, p. 395); and their perusal may be helpful to the student. The works recommended are set forth in the programme. The following prizes are open for competition: Ordinary Grade: (1) Salters' Company's prize of £1, and the Institute's silver medal; (2) do., and the bronze medal; (3) the bronze medal. Honours Grade: (1) Salters' Company's prize of £2, and the Institute's silver medal; (2) do., and the bronze medal.

The price of the programme is 9d. net.; post free 1s.

PLYMOUTH AND STONEHOUSE GAS COMPANY.

Increased Business.

The Annual General Meeting of this Company was held at the works last Thursday—Mr. J. A. BELLAMY in the chair.

In their report, the Directors expressed their pleasure in submitting a very satisfactory statement of accounts for the year ending the 31st of March last, which they felt would be highly gratifying to the proprietors. The Company's Bill, mentioned in the preceding report, received the Royal Assent on June 30, 1903; and the Directors had utilized the power given them under the Act of creating a renewal fund, which they hoped would enable them to meet the cost of heavy renewals out of revenue. From the balance of £23,653 remaining to the credit of profit and loss, a dividend for the half year ending the 31st of March was recommended as follows: 6½ per cent. on the ordinary stock, 9s. 9d. per share on the additional shares, and 9s. 3d. per share on the new shares created under the Act of 1879, less income-tax. This would absorb £9700, and leave £13,953 to be carried to the credit of the next account. The favourable freight and coal contracts referred to in last year's report, together with the increase in the demand for gas of 7 per cent. beyond that of the previous twelve months, had assisted principally in bringing about the prosperity experienced. The balance-sheet showed that the revenue was £114,489, compared with £108,245 last year. Of the former amount, £87,319 was received for gas, against £81,780; while £6671 was produced by stove and meter rents (including automatic supplies), against £6209, and £20,140 from residuals, compared with £19,736. The cost of manufacture showed a reduction from £71,751 to £71,271; and there was also a reduction in the rent, rates, and taxes, which were £2058, compared with £2402. The cost of distribution was £6007, against £5339; and that of management £4425, compared with £4298. The coal carbonized during the year was 58,781 tons; and 1,040,504 gallons of oil were used. Of the residual products, 16,046 tons of coke were used on the works, and 23,095 tons sold. Of breeze 2893 tons were sold, also 695,289 gallons of tar and 450 tons of sulphate of ammonia.

The CHAIRMAN, in moving the adoption of the report, said the year's working had been very successful. The business of the Company appeared to be fixed upon a very solid foundation, and the prospects were very cheering indeed. The capital they had had to raise during the year was £30,000; but in a large undertaking like theirs additional capital was constantly necessary. One feature in connection with the raising of the capital which gave him much satisfaction was that practically the whole of the £30,000 subscribed last year had been raised in the neighbourhood of Plymouth. This was evidence of the confidence of their neighbours in the undertaking. Of the total of £373,000, more than £250,000 was held in the locality; and the bulk of it was in the hands of small shareholders—the average being about £400 each. A new feature in the accounts—it came there in consequence of a clause in their last Act of Parliament—was a renewal fund. Hitherto this had not been allowed, though it seemed to him to be a very reasonable thing. Under their new Act, they were allowed to put aside for the renewal of plant a maximum of £3000 a year. They had, therefore, taken £10,000 of the recent expenditure on new plant as representing the value of the old premises, and they had been able, out of the profits of the year, to set aside the maximum of £3000 towards this £10,000. Another feature which the shareholders would be pleased to notice was that a very substantial sum had been brought into the account for the depreciation of the stoves and automatic meters. The capital value of the stoves, &c., might be put roughly at £6500; and they had now in the depreciation fund £4619—a large addition having been made this year. The increase of 7 per cent. in the business was a splendid result, because, after all, they had a strong competitor in the electric light under the control of the Corporation. It was proper that it should be so; for the Corporation had to administer their property for the benefit of the ratepayers. Undoubtedly, it interfered to some extent with the business of the Company; and the fact that, in spite of this competition, they had an increase of 7 per cent. was very satisfactory. The increase in the consumption of gas would have been enormously greater during the last few years had not incandescent lighting been introduced; for the old flat-flame burners would have consumed from one-fourth to one-third more gas than the new burners did. Since the last annual meeting the mains had been extended to Crown Hill. They were doing fair business, and, at all events, were in possession of the ground for future developments. It was the duty of the Company to exercise, within a reasonable limit of time, the powers granted to them by Parliament; but if outside authorities wished gas to be introduced into their districts, they ought to co-operate with the Company. Before the gas-mains were laid down, local bodies were very anxious

that it should be done; but afterwards, when a little spending on public lighting was in question, they were not so anxious. They did not seem to grasp the fact that new houses brought revenue into the local exchequer in increased yield of the rates, and that one of the ways to encourage building was to provide public lights. No public lighting had been ordered for Crown Hill yet; and he understood that the inhabitants had to hold a sort of indignation meeting in order to set the authorities going. This was not fair either to the inhabitants or to the Company. The same remarks applied to the outside district of Plymstock. The Directors had to administer the property on behalf of the shareholders, and with due regard to the duty they owed to the public; but they must have reciprocity from the local authorities. The inclined retorts erected since the last annual meeting had now been tested, and the results were perfectly satisfactory. There was considerable economy in every way; and they had been enabled, through the erection of these retorts, to do what they could not otherwise have done. They had effected many economies in other directions. The cost of manufacture for the past year had been 1s. 5d. per 1000 cubic feet—the lowest amount on record during the Company's existence. The make of gas per ton of coal was 10,822 cubic feet—the highest for the past ten years. They had also for the future the certainty that they would make better use of their residuals, and that a considerable additional sum would come into the accounts from this source. The condition of affairs being so prosperous, the Directors were willing to share this prosperity with the consumers. They did not lose sight of the fact that theirs was a consumers' company, and that the shareholders were really partners with the consumers. By the admirable Act of Parliament under which they worked, and which was really his ideal of municipal trading, after 5 per cent. had been paid to the shareholders on their investment, they only received 10 per cent. of the surplus profits; the balance being distributed in a reduced price to the consumers. This was the fairest way in which an undertaking possessing a monopoly could be carried on. They had something to offer the consumers in the coming year. They had tried the system of keeping incandescent mantles and burners in order for a fixed charge; and it had not worked satisfactorily. The Company had incurred a loss, and probably the consumers had not been altogether satisfied. Now they were going to undertake the maintenance of incandescent burners for the consumers free of charge. They would not supply the mantles free, but they would send a man to each consumer's house whenever a complaint reached them, and he would put the burners in order. This would get rid of a number of little troubles in connection with the fitting of mantles and the keeping of burners clean, which every consumer could not undertake for himself. It would involve an increase of the staff, and cost the Company a considerable sum; but they believed it was a right thing to do. With regard to the capital, he wished to point out that, in spite of the large outlay of recent years, the position was quite satisfactory. The capital now stood at 6s. 1d. per 1000 cubic feet of gas sold. It was 6s. 6d. in 1896, 6s. 8d. in 1898, and 7s. 2d. in 1899. They had, therefore, in the last few years brought down the proportion of capital to make of gas from 7s. 2d. to 6s. 1d. per 1000 cubic feet.

The DEPUTY-CHAIRMAN (Mr. J. H. S. May) seconded the motion.

The CHAIRMAN, replying to questions by shareholders, said, with regard to the consumption of gas by incandescent burners, it was easy to demonstrate that it was not so great as with flat-flame burners. Complaints of increased consumption, where they arose after the adoption of incandescent lighting, were no doubt due to the increasing demand for more light which modern and more luxurious systems of lighting had fostered. It was a strange coincidence that many customers who had adopted electricity did not seem so happy as before. It was the two accounts put together which caused dissatisfaction.

The report was adopted, and the dividends recommended were then declared.

The meeting having been made special, a resolution was adopted authorizing the issue of £40,000 of ordinary stock.

Mr. J. WILLS, a former Director, moved a vote of thanks to the Chairman, Directors, and officials. He said that, after half-a-century's connection with the Company, it was a great gratification for him to see the undertaking in so prosperous a condition. They had gas-works equal to any in the kingdom.

Mr. R. WOOLLAND seconded the resolution; and it was carried.

The CHAIRMAN, in reply, said he was pleased to be able to bear witness to the excellent work of the officials of the Company. Mr. Hoyte, the Engineer, was most assiduous, careful of every expenditure, and a most capable official; while Mr. Heath, the Secretary, had been many years with the Company, and gave great assistance to the Directors, whose relations with the men had been perfectly satisfactory. The new accommodation provided for them was much appreciated. The Directors got the very best work from the men; and the men got—what they were justly entitled to—generous treatment from the Company.

The proceedings then closed.

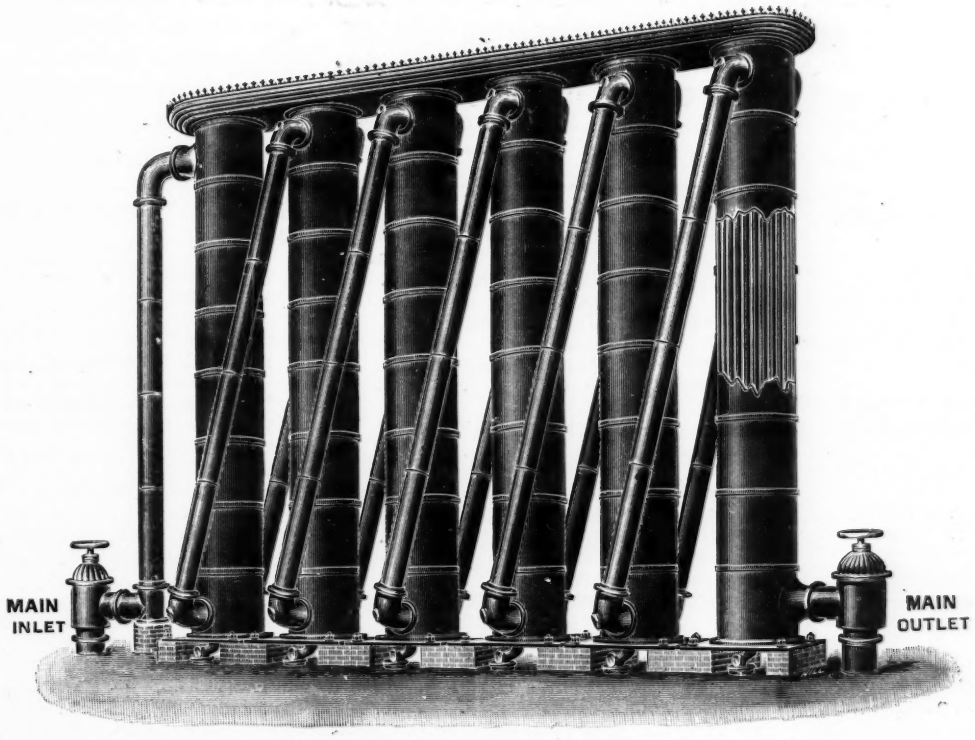
SWADLINCOTE GAS SUPPLY.

A Successful Year.

At the last Monthly Meeting of the Swadlincote District Council, the report of the General Manager of the Gas Department (Mr. George B. Smedley), for the year ending the 31st of March, was presented. It showed that for the first time since the gas-works were acquired by the Council in 1898 a profit had been realized. The works, which originally cost £43,000, have been practically rebuilt, regardless of cost; and the report furnished details of the principal changes made in the past twelve months. It was accompanied by some tabulated statistics of working, compared with the preceding year. The quantity of gas

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

C. & W. WALKER, LTD.,

Midland Iron Works: DONNINGTON, SALOP.
London Office: 110, CANNON STREET, E.C.

made was 44,624,600 cubic feet, or 10,502 cubic feet per ton of coal, against 45,827,400 cubic feet, or 9756 cubic feet per ton, in 1902-3. The unaccounted-for gas was reduced by 3,088,100 cubic feet—a reduction to the extent of 6·18 per cent. (from 27·5 to 21·32). The gas-rental from ordinary consumers amounted to £4832; from prepayment consumers, to £2060; and the hire of meters and cookers produced £273. These amounts were increases of £288, £632, and £18 on the amounts received in 1902-3. The cost per 1000 cubic feet of gas for coal and wages was 1s. 8·74d., against 1s. 9·99d.—a decrease of 1·25d. In submitting the report, the Chairman of the Lighting Committee (Mr. W. Belfitt) said it was the most satisfactory and encouraging one ever laid before the Council. Their year began with an adverse balance of £14. They had paid £1822 for interest and £849 principal, and had a balance in hand of £809 clear profit. In round figures, they had exceeded last year's statement by £1500, and at the same time had to pay an extra £600 on account of principal and interest. Next year these payments would amount to £3100. In comparison with last year, they had carbonized 448 tons less coal, and though the make of gas had decreased by 1,202,800 cubic feet, there was an average increase of 746 cubic feet of gas per ton. They had sold 1,885,300 cubic feet more than before. Mr. Smedley was congratulated on the excellent results obtained; and the report was adoped.

OLDBURY GAS DEPARTMENT.

A report and statement of accounts in connection with the Gas Department of the Oldbury District Council for the fifteen months from Dec. 31, 1902, to March 31, 1904, was issued on Friday by Mr. A. Cooke, the Secretary and Manager. It shows that the total amount borrowed in respect of the undertaking was £79,199, of which £18,817 had been repaid; the outstanding loans at the end of March last amounting to £60,382. During the period covered by the report, £960 had been expended on new meters, mains, and service-pipes; bringing the aggregate outlay up to £81,632. The amount received from the sale of gas was £18,058, and the residual products brought in £5907, which, with other smaller items, made the total income of £24,196. The manufacture of gas cost £13,211; and its distribution £1702. The amount expended on public lighting was £1095; on rates and taxes, £1306; on management, £453—making the total expenditure £17,767, and leaving a gross profit of £6429; after making provision for the interest on loans and the instalments for their repayment, there remained a balance of £1892; being the net profit for the fifteen months. For the year ended Dec. 31, 1902, the net profit was £1297.

Reduction in Price.—The Cowes District Council have resolved that the price of gas shall be reduced 2d. per 1000 cubic feet (to 3s. 7d.) as from the 1st prox.

PUBLIC LIGHTING OF NORWICH.

Gas Preferred to Electricity.

At the Meeting of the Norwich Town Council last Tuesday, the question of renewing the arrangements for the public lighting of the city was under consideration. In reply to advertisements inviting a tender or tenders for lighting the city for one, two, or three years from the 1st prox., four tenders had been sent in; but two of them were set aside. The others were from the British Gaslight Company, Limited, and the Electricity Committee of the Corporation. Mr. Young, speaking for the Executive Committee, explained that the tender of the Gas Company was for lighting the whole of the city, and that of the Committee for lighting a limited area only. The former tender was on exactly the same terms and conditions as the current contract, which would expire on the 1st of July—viz., £3 5s. for each incandescent lamp and £3 2s. for each lamp where the standards were provided by the Corporation. The Executive Committee recommended that the tender of the Gas Company should be accepted. One of the terms of the present contract was that the Company should convert 200 of the lamps per annum into incandescent lights—making 600 in the three years. They had gone beyond what was demanded of them, and had converted nearly 1000 lamps—thus showing their great desire to provide the citizens with a good light at a more rapid rate than they were really obliged to do. If the second tender had come from an ordinary commercial firm or company, he would have said nothing about it; but as it came from one of the Committees of the Corporation, he thought it only fair and right that the members of the Council should have some information as to its nature. The tender of the Electricity Committee was for lighting a specific area of the city; and their main proposal was to erect 28 arc lamps in certain open spaces and wide streets. The cost of 21 of these lamps would be £16 each per annum, and of seven of them £17 each. The 28 would cost £455. These arc lamps would displace 90 of the present gas-lamps. Thereby hung a test, not only of the efficiency of the lighting, but of the expense. The cost of the 90 gas-lamps worked out at nearly £300 a year; and the cost of 28 arc lamps would be £450—just 50 per cent. more. This was not the only fact the Executive Committee had to look at. It was contended that these 28 arc lamps would give a very much greater amount of light than the gas-lamps; but, on the other hand, it would be remembered that it was necessary to put lamps in certain positions, in order that the light might show down narrow ways and at corners. It was obvious that 28 fixed lamps could not do the work so well as 90. For the Nernst lamps, the Electricity Committee wanted £3 7s. 6d., which was more than the Gas Company charged. Gentlemen could form their own opinion as to whether the Nernst lamps were better than the incandescent gas-lamps. He thought gas held its own, and gave a very excellent light. He moved—"That the Executive Committee be authorized to accept a tender or tenders for public lighting for one, two,

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled) .	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . .	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA. . . .	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.) .	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract) . .	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN. . . .	500,000	ROCHESTER (Second Contract) .	500,000
WINDSOR ST., BIRMINGHAM (Second Contract) . . .	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.).	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil) . . .	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled) . .	125,000	CRYSTAL PALACE DISTRICT .	2,000,000	DULUTH, MINN. (2nd Cont.) .	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.) . . .	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract).	250,000	ENSCHEDE (HOLLAND) . .	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract) . .	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract) .	1,000,000
		KINGSTON-ON-THAMES . .	1,750,000	MONTREAL, ONT. (2nd Cont.) .	1,800,000
		ACCRINGTON.	500,000	HAMILTON, ONT.	400,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
AND, IN ADDITION, 3,000,000 CUBIC FEET DAILY.

or three years, from the 1st of July next, and that the Town Clerk be authorized to affix the corporate seal to a contract or contracts to carry out the tender or tenders." Mr. Green seconded the motion, and said he thought the management of the street lighting by the Gas Company was beyond reproach. They had laid themselves out to secure the best possible results. He believed the Company were wise in their day and generation, because incandescent lights consumed less gas than the ordinary burners. The motion was carried.

OSSETT CORPORATION GAS SUPPLY.

Progress of the Undertaking.

At the last Monthly Meeting of the Ossett Town Council, the annual report of the Gas Manager (Mr. A. E. Mottram), from which some few particulars were given in the "JOURNAL" last week, was presented with the minutes of the Gas Committee.

Alderman AUDSLEY, the Chairman of the Committee, in moving the adoption of the minutes, said they had adopted a balance-sheet which showed a very successful year's working. So far as receipts were concerned, they had done well with residuals. The gross profit on the year's working was £7837, compared with £5965 for the previous year—an increase of £1872. Interest and sinking fund charges amounted to £6297; and there had been paid off a portion of the suspense account—leaving a net profit on the year's working of £1132. On the first nine months' working they had a deficit of £766; and in the first complete year's working (that was to say last year) by the Corporation, they had a loss of £278—making a total loss for the first year and nine months of £1044. Deducting this from last year's profit, they had a net sum of £88 for the two years and nine months' working. The make of gas had been 93,918,000 cubic feet, against 85,546,000 cubic feet the previous year—an increase of 8,372,000 cubic feet. The net quantity sold was 81,387,300 cubic feet, or 6,782,300 cubic feet more than in 1902-3. The coal used in excess of the previous year was only 250 tons; and for this they had obtained the increased amount of gas mentioned. The make of gas per ton of coal was 11,014 cubic feet, against 10,335 cubic feet—an increase of 679 cubic feet, which was worth 2s. for every ton of coal they had used. This made a difference of £852 14s. on the year's working, on account of the increased sale of gas per ton of coal used. To show the progress of the undertaking, Alderman Audsley said that in the year 1898, the make of gas was 76,010,000 cubic feet; but during the year just closed it was 93,918,000 feet—an increase of 17,908,000 feet in six years. In 1898, the gas sold was 63,376,687 cubic feet; so that there was an increase of 18,110,613 cubic feet in 1904 compared with six years ago. The coal used in 1898 was 8092 tons, while last year it was 8527 tons—an increase of only 435 tons; yet they had made all this extra quantity of gas. If only the same bulk of gas per ton of coal had been made as in 1898, they would have had to use 2000 tons more coal. They had therefore effected a considerable saving, which had enabled them to pay an increased £2000 a year for interest and sinking fund. The gas made per ton of coal in 1898 was 9339 cubic feet; whereas the year just closed showed an increase of 1675 cubic feet, while the gas sold in these years was 7832 cubic feet and 9555 cubic feet respectively. This increased sale of gas per ton of coal was equal to 5s. per ton, or a total saving of £2131 15s. Going farther back, in 1890 the quantity of gas made was 58,072,000 cubic feet; while 14 years later it had increased by 34,846,000 feet. The gas sold in 1890—the year of the incorporation of the borough—was 49,352,940 feet; and in fourteen years it had increased by 32,134,360 feet. He could remember that when they were advised to buy the gas-works, they were told that, under ordinary conditions, the output would be doubled in 14 years; and they found this had taken place. If they were all living at the close of another similar period, he believed they would see the output once more doubled, and the price of gas nearer 2s. than 3s. They had agreed to reduce the price of gas 3d. per 1000 cubic feet. This would just about take the amount they had made in profit during the past year; but they hoped, of course, that there would be an increased sale. In order to bring the increased sales more clearly before the Council, he would mention the quantity of gas sold in 1901 and 1904. The former year was the one before they purchased the undertaking, and the sale was 69,843,561 cubic feet, less by 11,843,739 feet than it was three years after. These figures spoke for themselves, and showed that gas was becoming more popular even now. He hoped the undertaking would go on successfully paying its way, and that the ratepayers would have even greater cause than now to feel glad that they had become proprietors of the gas-works. When they took over the works three years ago, the number of consumers was 3452; while at the end of March last there were 5350—an increase of 1898. The amount paid for gas showed that, on an average, each consumer paid 10½d. weekly, or 1½d. per day. Taking it another way, a cottage would burn about 6000 cubic feet a year, for which they would have an average gas bill of 5s. per quarter.

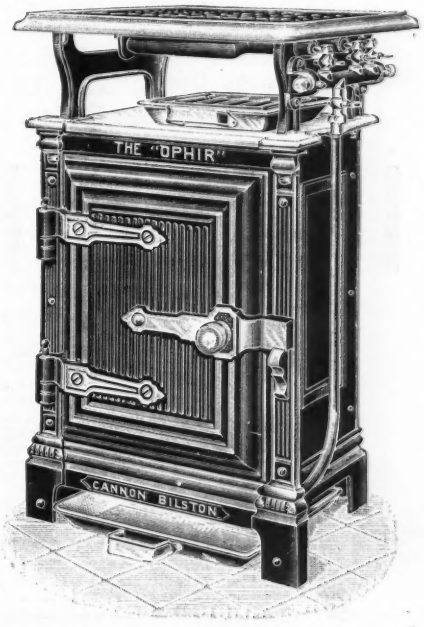
Mr. BENTLEY, who seconded the motion, congratulated the Chairman of the Committee upon the statement he had been able to submit. He said it was extremely satisfactory, and reflected credit upon the management. It also proved the wisdom of the determination shown by the ratepayers to become possessors of the gas-works.

Mansfield Corporation Gas and Water Supply.—At the last meeting of the Mansfield Town Council, the Gas Committee reported a profit of £2909 on the gas undertaking for the past financial year, after payment of loans, treasurer's interest, and contributions to the sinking fund; while the Water Committee announced that a net profit of £2232 had been made.

"CANNON" NEW SERIES GAS COOKERS.

DOUBLE CASED. PACKED AND ENAMELLED THROUGHOUT.

UP-TO-DATE IMPROVEMENTS.
SPECIAL FEATURES.
LARGE OVENS.
LOOSE BURNERS.
LOCKING GRIDS.
SLIDING MEAT HOOK, &c., &c.



WRITE US FOR PARTICULARS.
SPECIAL PRICES FOR QUANTITIES.

CANNON IRON FOUNDRIES, LTD., DEEPFIELDS, NEAR BILSTON, STAFFS.
AND BATH HOUSE, 57-60, HOLBORN VIADUCT, LONDON, E.C.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Annual Accounts.

At the Meeting of the Edinburgh and Leith Gas Commissioners yesterday, the Treasurer (Mr. John S. Gibb) laid upon the table an abstract of the accounts for the financial year ending the 15th of May last; and it was remitted to the Finance Committee. The gross receipts amounted to £79,470; the annuities and interest came to £66,907—leaving the net balance £12,563. The sinking and reserve funds require £16,953; so that there is a debit balance of £4390 to be carried forward. With regard to working, there were 33 million cubic feet more gas sold than in the previous year; but the revenue therefrom was less by £17,800, resulting from the reduction of 3d. per 1000 cubic feet in the price, which took effect last October. About £5000 more was received for residual products, due to larger quantities sold; tar having been down from 33s. to 17s., and sulphate down £1. It is anticipated that there will be an increased sale of gas, which will clear off the debit balance without any necessity for raising the price of gas.

METROPOLITAN WATER BOARD.

The Board Take Possession—Appointment of Chief Engineer.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Mr. R. M. BEACHCROFT in the chair.

The Finance Committee reported that, pursuant to section 17 (1) of the Metropolis Water Act, 1902, they had obtained the consent of the Local Government Board to the rate of interest on Metropolitan Water (B) stock being fixed at 3 per cent. per annum. They also reported that they had received the consent of the Board to the borrowing of £7200, being the costs of the Act, and the sum of £260,800 for certain other payments made under the Act. They further stated, in continuation of their report of the 10th inst., that they had received estimates from the various Water Companies of the amounts they would require under the provisions of section 41 of the Act—viz., Chelsea, £2965; East London, £40,000; Grand Junction, £8000; Kent, £5000; Lambeth, £5000; Southwark and Vauxhall, £10,000; and West Middlesex, £5000.

The estimates were submitted, and the amounts were included in the list of proposed payments, which was passed.

The General Purposes Committee recommended that Mr. A. E. Pinnell should be appointed District Secretary for the East London district, at a salary of £660 per annum; Mr. J. Wilson for the Grand Junction district, at £500 per annum; and Mr. T. E. Barnett for the West Middlesex district, at £700 per annum. The Board agreed to the recommendations.

The report of the Special Arbitration Committee was subsequently submitted.

The CHAIRMAN, in moving the adoption of the report, said that, with one exception, the water undertakings of the Metropolis had that day been vested in the Board; and their responsibility for supplying 6¾ million people with water had begun. The exception was that of the New River Company, who had applied to the Local Government Board for a postponement of the appointed day in their case. The Board had had the application under consideration, and, in view of the appeal pending in the House of Lords, they had, in an order issued on Thursday, postponed the vesting in the New River case until the 25th of next month. There was reason to believe that the arbitration proceedings would be completed before that date.

The Board adopted the report, and agreed, in order to avoid the expense of a separate appeal to the House of Lords upon the sinking-fund question, to abide by the decision to be given in the appeal of the New River Company, in accordance with the suggestion made by the Court of Appeal to this effect.

The Works and Stores Committee submitted estimates of expenditure to be incurred after the 24th inst. They stated that at present it was difficult to frame an estimate of expenditure on maintenance account by any other means than that of adopting as a basis the actual expenditure of the Companies in the past. This had been done by the Accountant, who had submitted an estimate of £122,982 in respect of expenditure on maintenance account from June 24 to Sept. 30 next. With regard to capital expenditure, they had had before them estimates prepared by the Engineers of the respective Water Companies of the expenditure which they considered would have to be incurred during the next three months, and they amounted to £147,817. The Board approved the estimates.

The Board then proceeded to the appointment of a Chief Engineer. The Works and Stores Committee submitted the names of the following candidates: Mr. W. B. Bryan (the Chief Engineer of the East London Water Company), Mr. Ernest Collins (the Distribution Engineer of the New River Company), and Mr. H. F. Rutter (the Engineer of the West Middlesex Water Company). Of these three candidates, they recommended that Mr. Bryan should be appointed. After some discussion, it was decided, by 33 votes to 14, to appoint Mr. Bryan as Chief Engineer to the Board, at a salary of £2500 per annum. It was also resolved that Mr. Bryan should receive, while in the Board's employ, in addition to the salary, such further sum in lieu of pension during his term of service as would with the £2500 make an annual sum payable to him of £3750, and that he should not be permitted to take any private practice or other paid employment, with the exception of matters to which he had referred in his application.

A special report of the Finance Committee set forth that on the 3rd inst. the Committee submitted a report with regard to the issue of water stock in discharge of sums payable to the Water Companies under the awards of the Court of Arbitration; and the Board, upon the recommendation, passed the following resolutions: (*a*) "That it is

COKE BREEZE

Can be satisfactorily removed by Screens; but by using Little's Conveyors for carrying away the Coke from Retorts, the only Breeze to be handled is that which is inseparable from all systems of carbonizing. This can usually be burned under the Boiler, so very little need be put into the

INCLINED RETORTS.

Breeze is the bugbear of all Gas Engineers, as every cwt. handled is not only a loss in value, but represents wear on the plant.

OUR SPECIALITIES:

COKE CONVEYORS.
COAL CONVEYORS.
INCLINED RETORTS.
SHALLOW INCLINES.

OUR AIM:

NO SUPERFLUOUS BREEZE.
LONG LIFE.
RESULTS BETTER THAN HORIZONTALS.
LOW COST—WITH EFFICIENCY.

NEW CONVEYOR Co., LTD., SMETHWICK.

desirable to discharge the liability of the Water Board to Companies under the awards of the Court of Arbitration as soon as convenient after the appointed day ; " (*b*) " that the Finance Committee be and are hereby authorized to ascertain, in concert with the Bank of England, the manner in which effect may best be given to the foregoing resolution, and to take all necessary steps with a view to the issue of stock, and to make such arrangements as may be found desirable to secure such issue, the terms thereof being reported for the approval of the Board." The Committee accordingly appointed a Sub-Committee to carry on the necessary negotiations on behalf of the Board. The Sub-Committee had been in constant communication with the Governor of the Bank of England, and on his advice they requested the Government Broker (Mr. H. A. Daniell) to act as their representative for the purpose of negotiations. These were opened, in the first instance, with the West Middlesex Company ; and after some correspondence an agreement was arrived at that the Company should receive £109 10s. of 3 per cent. water stock of the Board for each £100 of cash awarded by the Court of Arbitration. The Committee decided to submit a recommendation to this effect ; and at the same time they gave instructions for a communication to be made to each of the other Companies concerned that they were prepared to advise the Board to enter into a similar agreement with them. A further meeting of the Board would be held after the required statutory notice on July 8 to pass the necessary resolutions, when it was hoped that a definite conclusion would be arrived at with the other Companies. The report went on to state that it was clear that the terms offered to all the Companies must be identical ; and the Finance Committee had directed that a letter should be addressed to the Secretary of each of the Companies (other than the New River and West Middlesex) setting forth the terms, and asking that those terms might obtain the favourable consideration of the shareholders. There was reason to believe that several of the Companies besides the West Middlesex had already recommended the acceptance by the shareholders of the terms suggested.

The Finance Committee recommended that the Board should approve the offer laid by them before the Companies to the effect that the Board would wholly or partially discharge the compensation payable to them by the issue of 3 per cent. Metropolitan Water "B" stock to the Companies at the rate of £109 10s. of stock for each £100 cash awarded ; and that a meeting of the Board should be convened for July 8 next for the purpose of adopting resolutions authorizing the making of agreements to give effect to any arrangements concluded with the Companies, or any of them, consequent upon the making of that offer. On this report the Board went into Committee.

The Water Committee of the Carlisle Corporation have accepted the tender of Messrs. Kennedy, Limited, of Partick, to carry out contract No. 1 (comprising the Cumwhinton reservoir, filter, mains, &c.) in connection with the Geltsdale gravitation water scheme, for £100,377. The Engineers' estimate was £122,724.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I think I may safely say that the questions which have agitated the Town Council of Falkirk over the provision of new gas-works for the town are now in a fair way for solution, but not quite amicably. A month ago, the mind of the Council was stirred with the idea of their building a railway to Thornhill at their own expense, and a remit was made for a report upon the subject. At the meeting of the Town Council on Monday, the Gas Committee stated that they had had before them a report by Mr. W. M'Crae, the Manager, and Mr. Ronald, as to the cost of constructing such a railway. But the Committee did not communicate to the Council what the cost was. On the contrary, they proceeded to lay before them a narrative of further negotiations which they had had with the General Manager of the North British Railway, whom they considered they had now persuaded to agree to almost all that they desired ; and they asked that an agreement with the Railway Company providing for the Company making the railway, and working it, should be concluded. Mr. H. Russell, the Convener, in moving this, said the fear of the Council had been that the Railway Company wanted to make a yard beside the new gas-works, which they would use for the marshalling of goods trains from a wide district, and which would be a danger to the community on account of the level crossings on the lines. The General Manager had declined to put into the agreement an undertaking that this would not take place ; but he expressed his willingness to give a letter to the effect that only local traffic would be dealt with. Mr. Russell therefore thought they had now got a fair bargain, as far as they could reasonably expect the Railway Company to give them. Eventually the motion was agreed to by the casting vote of the Provost.

The Directors of the Hawick Gas Company recommend that the price be reduced from 2s. 11d. to 2s. 8½d. per 1000 cubic feet. A similar reduction of 2½d. was made a year ago.

For the post of Manager of the Montrose Gas Company, which is about to become vacant by the resignation of Mr. T. D. Hall, after nineteen years' service, there have been about eighty applicants. The list has been carefully gone over by the Directors ; and a provisional short leet of five has been drawn up. The appointment will probably be made next week. The Company adhere to the custom of electing the Manager, as well as the other officials, year by year.

The Peterhead Town Council, with the view to further inducing the community to use gas for cooking and heating purposes, have approve of the recommendation of the Manager (Mr. J. Keillor) that a range-plate, or grill, or boiling-ring, be provided and fitted free to consumers with prepayment meters who may prefer them to a slot-cooker. It was reported that the quantity of gas manufactured last year amounted to 32,788,400 feet, as compared with 30,944,500 feet in the preceding year.

Richmond's

COOKER COMPETITION

THE WINNER IS—

Mr. F. ROBINSON, Clacton-on-Sea,

WHOSE LETTER WAS FIRST OPENED CONTAINING THE CORRECT SOLUTION—VIZ., **"Crusader."**

Advertisement of THE RICHMOND GAS STOVE AND METER COMPANY, LTD., Stratford and Warrington.

The collector in the Dumfries Corporation Gas Department, Mr. John Holmes, having died recently, there were fifty-one applicants for the post; and a special meeting of the Town Council was held on Tuesday to make an appointment. At the beginning of the proceedings, Mr. Currie, the Convener of the Gas Committee, and others paid a tribute to the able and conscientious way in which Mr. Holmes discharged his duties during the four years in which he held the office; and a resolution of condolence and sympathy with his widow and family was adopted. The Committee brought forward three names as a short leet from which to make the appointment; but there was some sharp criticism of their action, chiefly on account of having passed over applicants who were ratepayers in the town, and selected young men who had not the same standing in the community. Out of deference to the wishes of the objectors, four names were added to the leet. The Council then sat in private to make the appointment; intimating afterwards that Mr. Robert Reid, a solicitor's clerk in the town, had received eleven votes, to five for another candidate, and four for a third. Mr. Reid was accordingly declared elected. He was one of those who were recommended by the Committee.

The Gas Committee of the Aberdeen Corporation on Wednesday appointed Mr. C. E. Smith to be Assistant Gas Manager.

A scheme for the filtration of the water supplied to Dundee from the old water-works at Monikie has been submitted to the Water Committee by Mr. G. Baxter, the Engineer. He points out that the Corporation have considered the desirability of filtering the water at intervals during the past 58 years. When the new supply from Lintrathen was brought in, about 30 years ago, filtration at Monikie was rendered unnecessary, as the supply from Lintrathen was abundant. Now, however, the mains from Lintrathen have become so much incrusted that their capacity has been greatly reduced. The first main is only carrying 5½ million gallons per day, instead of 8 million gallons, as at first; and the capacity of the second main has been reduced by 1 million gallons per day. Mr. Baxter at first thought he might be able to get sufficient additional water at Monikie for the supply of the city and district; but he is now satisfied that water cannot be obtained free from contamination upon manured lands. He therefore proposes that four filter-beds, to pass 2½ million gallons of water per day, and a clear-water well, to hold half-a-million gallons, be erected, at a cost of £13,000, which could be extended, at an additional outlay of £3000, if the burgh of Carnoustie should ask that their supply be filtered. Mr. Baxter's report was before the Water Committee on Tuesday, and was ordered to be printed and circulated.

Last Saturday a very pretty ceremony took place at the Craigmaddie and Mugdock reservoirs, belonging to the Corporation of Glasgow, in the unveiling of a drinking fountain, which has been erected by the staff in the Water Department, to the memory of the late Mr. J. M. Gale, who was Water Engineer to the Corporation from 1859 to 1902. The unveiling was performed by Bailie Carswell, the Convener of the Water Committee, in presence of a number of councillors and members of the staff. He said that the Water Commissioners had very great pleasure in coming there and accepting the memorial on behalf of the Corporation of Glasgow. Mr. Gale, however, required no memorial of any kind, of stone, as they had around them the best memorial which could be found for him, in the beautiful water-works there. They were a monument which would last for ever; and they were the work to which Mr. Gale gave the best part of his life. Mr. W. M. Gale expressed the thanks of his mother, his sister, and himself for the goodness of the staff in erecting the fountain to the memory of his father. The fountain is in the form of a granite shaft, standing upon a base of quartz from Loch Katrine.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 25.

Sulphate of Ammonia.

Although there has been no very special demand, all parcels offered have met a ready sale at slightly hardening prices; Scotland taking the lead. The closing quotations are consequently £11 18s. 9d. to £12 per ton f.o.b. Hull and Liverpool, and £12 2s. 6d. per ton f.o.b. Leith. There have been some Colonial requirements, but the bulk of the purchasing has been for the purpose of covering contracts; buyers abroad having scarcely yet got into step with the upward movement. The firm attitude of makers has arrested forward speculative buying, and although there has been a good direct inquiry, the views of buyers abroad are too low to admit of much business.

Nitrate of Soda.

This article is unchanged, the spot prices being 10s. to 10s. 3d. per cwt., according to quality.

LONDON, *June* 24.

Tar Products.

Markets still remain in rather a depressed state; there being an absence of demand, especially as regards Continental consumers. Pitch is, if anything, a little easier; makers on the east coast having accepted 32s. in several instances for early delivery. Just at present makers appear more anxious to sell for July-October than over the whole of next season; but as consumers are fairly well supplied for early delivery, there is at the moment a scarcity of demand for prompt shipment. Dealers are still offering for forward delivery at very low prices; and they are evidently speculating on a further reduction in value when some of the heavier tar contracts are arranged. The market in creosote continues fairly good; but there is certainly more offering in the country just at the moment—one or two makers being evidently anxious to clear out their stocks during the summer months, so as not to commence the winter with their tanks full. As regards London, the market is steady; and there has been a fairly good demand for both prompt and forward delivery, though prices do not improve. There is nothing fresh to advise in anthracene. Foreign consumers

THE
MAXIM PATENT CARBURETTOR
FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 120 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Ten Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

appear quite indifferent as to the position of the market for either prompt or forward delivery, though there is little or no doubt they would purchase all over next year if they could obtain what they consider reasonable terms. The demand for crude carbolic acid is very good; and business continues to be done at 2s. for July-October. Certain makers report business at 2s. 0¼d. and 2s. 0½d., while in some instances 2s. 1d. is asked; but it does not seem as if consumers would pay more than 2s. at present. Probably, therefore, some of the business recently done is of a speculative nature. Crystals are decidedly quiet. It is reported that German manufacturers are accepting lower prices for forward delivery than those now ruling for July-August shipment. A little business has been done in 90 per cent. benzol at 9d., London; while in 50-90 per cent. some quantity was sold at 7d. delivered to works, for home consumption. Solvent naphtha is very depressed, especially in the Lancashire district, where makers are reported to be accepting very low prices for prompt delivery, evidently having large stocks which they are anxious to reduce. In London, there is no business to advise. Makers still ask 7¾d. to 8d.; but consumers are not willing to pay these prices, and there is no demand for export.

The average values during the week were: Tar, 17s. to 22s. Pitch, London, 31s. 6d. to 32s.; east coast, 31s. to 31s. 6d.; west coast, 29s. 6d. to 30s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6¼d. to 6¾d. Crude naphtha, 3d.; solvent naphtha, 6¼d. to 8d.; heavy naphtha, 9½d. to 10d. Creosote, London, 1½d.; North, 1⅜d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 2s. to 2s. 0½d. Refined naphthalene, £5 to £8; salts, 22s. to 24s. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The sulphate of ammonia market is steady; and there is a fair business doing. The demand is, however, almost entirely for forward delivery. Beckton would accept £12 for prompt; but they would not take less than £12 2s. 6d. for July-September, while for October-March they ask £12 7s. 6d., and are reported to have declined £12 5s. Another large London Company have sold on their own terms at £12 2s. 6d., and are reported to be now asking £12 5s. In Hull, a fair business has been done at £11 18s. 9d. to £12 for July-August shipment; while contracts have been made for July, 1904, to March, 1905, inclusive, at £12 1s. 3d. to £12 2s. 6d. The price in Liverpool is nominally £11 17s. 6d. to £11 18s. 9d; but it is reported that sales have been made at £12 for early shipment in more than one instance, though quantities were limited. Makers in Leith quote £12 2s. 6d.; and business is reported to have been done at this price, though, as a rule, buyers are not willing to pay more than £12 for early shipment. There is, however, a fair inquiry for forward delivery at this port.

Drakes Limited, of Halifax, have secured orders for the erection of their tube regenerator furnaces at Mansfield, Portishead, Stoke-on-Trent, and Walker-on-Tyne.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Business generally throughout the coal trade of this district remains much as reported for some time past. Pits continue to work from three to four days; and the output is just about passing through, with stocks of some descriptions accumulating at collieries. No quotable alteration can be reported with regard to house-fire coals. Engine classes of fuel, if anything, are rather firmer than last week. Quoted rates may be given as 13s. to 14s. per ton at the pit for best Wigan Arley, 11s. to 12s. for seconds Arley and Pemberton four-feet, and 8s. 6d. and 9s. to 10s. for common house-fire coals. Steam and forge coals remain at 7s. 6d. to 7s. 9d. and 8s. and 8s. 3d. per ton at the pit. Very little is doing in gas coals, with prices remaining at 9s. 6d. to 9s. 9d. and 10s. for good screened Wigan Arley and 7s. 9d. and 8s. 3d. to 8s. 6d. and 8s. 9d. for Wigan four-feet. The firmer tone in engine fuel is perhaps due to the more restricted working of the pits, and the cotton mills being put on more extended time. Prices remain at 6s. to 6s. 6d. per ton at the pit for best slack, 5s. to 5s. 6d. for medium, and 4s. to 4s. 6d. for common.

Northern Coal Trade.

There has been a very limited production of coal during the last few days; local holidays having greatly reduced the work. Steam coals are thus rather scarcer, and prices are a little steadier. Best Northumbrian steam coals are 10s. 3d. to 10s. 6d. per ton f.o.b., second-class steams are 8s. 9d. to 9s., and steam smalls vary from 4s. 3d. to 4s. 9d. There is now full work for the collieries generally for the next fortnight or so. Gas coals are fairly steady, and the demand should soon increase. Prices of good Durham descriptions range from about 7s. 10½d. up to 8s. 6d. per ton f.o.b., according to class, for occasional cargoes. Contracts for one of the French ports are concluded; and it is believed that the prices, if below those of the previous contracts, will leave something like 8s. per ton f.o.b. for good qualities. Coke is firm. Gas coke, being rather scarce, maintains its position at about 15s. 3d. per ton f.o.b. for good quality.

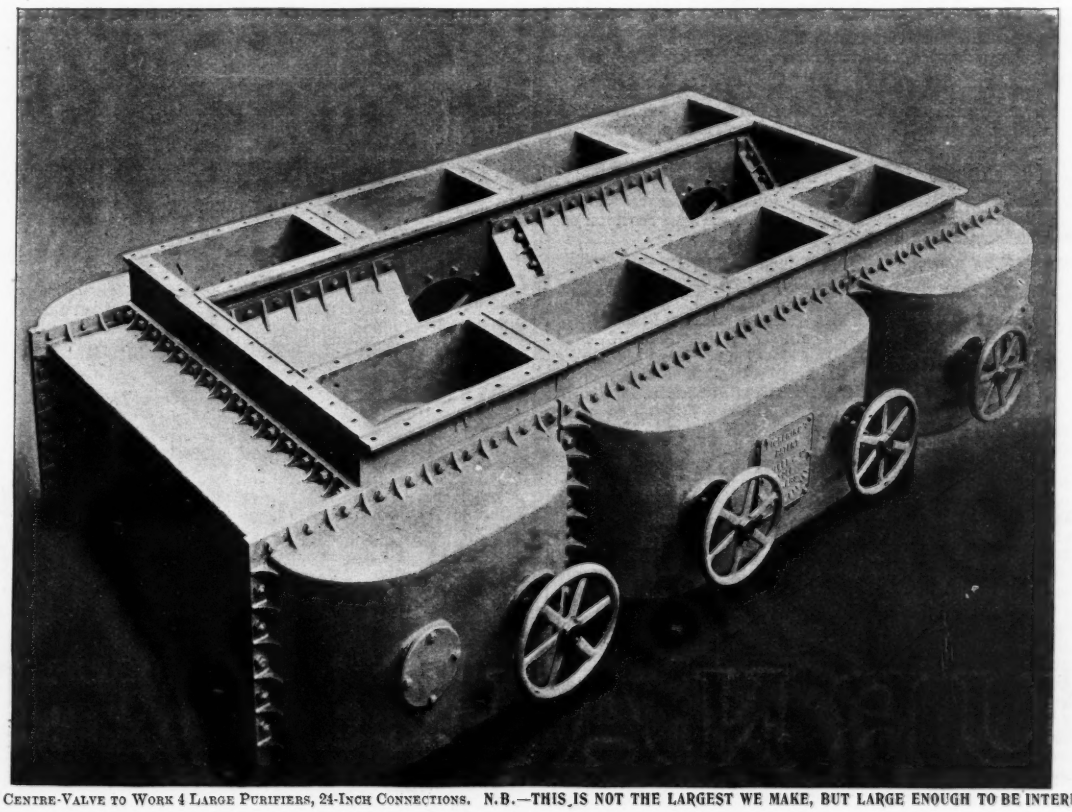
Scotch Coal Trade.

Trade shows no sign of improvement; the pinch is being more felt in the west of Scotland than in the Lothians or Fife. Broken time is very common at western collieries; and this is already being used to enforce the demand which the masters are making for a reduction of the miners' wages. The prices quoted are: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 8s. to 9s. 3d., and splint 8s. to 8s. 6d. The shipments for the week amounted to 245,075 tons—an increase of 48,174 tons when compared with the preceding week, but a decrease of 2644 tons when compared with the corresponding week of last year. For the year to date, the total shipments have been 5,021,368 tons—an increase of 131,673 tons upon the same period of 1903.

PICKERING'S PATENT PURIFIER VALVES.

No Connections. Easy to Work. Small Cost. Space Saved. Absolutely Sound. Most Simple.

Apply WILLEY & Co., LD. ENGINEERS, LONDON AND EXETER.



VIEW OF CENTRE-VALVE TO WORK 4 LARGE PURIFIERS, 24-INCH CONNECTIONS. N.B.—THIS IS NOT THE LARGEST WE MAKE, BUT LARGE ENOUGH TO BE INTERESTING.

Incandescent Gas Lighting in New York.—With a view to improving the lighting of New York, Welsbach burners are to be substituted for open-flame gas-burners in the public lamps throughout the boroughs of Manhattan and Brooklyn, if the recommendations of Commissioner Oakley, of the Department of Water Supply, Gas, and Electricity, are carried out. At present New York uses from 5000 to 6000 incandescent gas lamps and 19,000 flat-flame burners. The latter are of 12-candle power; while the incandescent burners are of 60-candle power.

Incandescent Gas Lighting for Kingsteignton.—It has been decided by the Parish Council of Kingsteignton to enter into a contract with the Newton Abbot Gas Company for the public lighting of the village. The amount to be paid is £60 per annum, and the term of the contract is to be five years. Hitherto the lighting has been done by oil. The number of lights is to be increased, and incandescent burners and mantles used. At a public meeting which was called to endorse the action of the Council, great satisfaction was expressed at the introduction of gas lighting.

Sale of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards sold, by order of the Directors, new issues of £10 ordinary and preference shares in the Aldershot Gas and Water Company. The former, which will carry a dividend of 7 per cent., fetched an average of £13 per share; and the latter, which are 5 per cent. shares, an average of £10 13s. 2d. each. On the same occasion, some additional consolidated ordinary 5 per cent. stock of the Maidenhead Gas Company was issued for the Directors at an average of £100 3s. 2d. per £100 of stock. The last dividend on similar stock to this was at the rate of £5 7s. 6d. per cent.

Birkdale Gas Supply.—Mr. J. F. Keeley, the Clerk to the Birkdale Urban District Council, has prepared his annual statement with reference to the gas supply. The gas-mains in the district are owned by the Council, and the Southport Corporation supply gas at 3s. 2d. per 1000 cubic feet, less 5 per cent. if paid within a month. The Council pay the Southport Corporation 2s. 9d. per 1000 cubic feet for gas for public lighting, on which there is no rebate. The Corporation pay for the right of supplying Birkdale with gas and for the use of the mains 8d. per 1000 cubic feet on the gas used for domestic purposes. The illuminating power has been reduced from 20 to 16 candles.

Devonport Water-Works Arbitration.—We learn from the "Western Morning News" that there is a prospect of the arbitration proceedings, for settling the terms upon which the Devenport Water-Works are to be transferred from the Water Company to the Corporation, being reopened almost immediately. Mr. Ram, K.C., who was appointed as Umpire after the death of Sir Frederick Bramwell, was supplied before Whitsuntide with a copy of the proceedings; and it is understood he has intimated that he does not require further evidence. A communication has been made with the parties, with the view of arranging a convenient date for reopening the proceedings, when, it is presumed, Counsel on both sides will be given an opportunity of addressing the Arbitrators (Messrs. Charles Hawksley and G. H. Hill) and the Umpire.

Incandescent Gas Lighting in Stepney.—At the meeting of the Stepney Borough Council on Wednesday last, the Works Committee reported that they had considered a letter from the Engineer of the Commercial Gas Company (Mr. S. H. Jones) reminding them that prior to the acceptance of the Company's offer, in the matter of street incandescent gas lighting, of May 19, 1903, there were a number of street-lamps in the borough lighted by the incandescent gas system to which the offer did not apply, and intimating that his Directors were prepared, when certain necessary alterations had been carried out to the burners, to put these lamps on the same footing with regard to charge as those now being fitted with Kern burners; the reduced charge of £2 18s. per lamp per annum not to come into operation, in the case of any lamps which might not have been in use with incandescent lighting for eighteen months until this period had elapsed. The present charge in the case of the lamps in question is £3 9s. per lamp per annum; so that by accepting the offer a further saving in the cost incurred in street lighting would be effected. It was further reported, with respect to the lamps that the Company are now fitting with Kern burners, that 919 had been provided with No. 4, and 369 with No. 3. This in the opinion of the Committee was "substantial progress in the carrying out of a task of no small magnitude." It was resolved to accept the offer contained in the letter.

The Marylebone Electric Lighting Scheme.—The Finance Committee and the Electric Supply Committee of the Marylebone Borough Council have had under consideration the arrangements which will be necessary for the transfer of the Marylebone undertaking of the Metropolitan Electric Supply Company, Limited, to the Council. The Finance Committee of the London County Council have given the Borough Council an assurance that they may rely upon receiving their loan of £1,415,000 not later than Oct. 20 next, and, in accordance with a resolution of the Borough Council, their Finance Committee have been in communication with various lenders with a view to obtaining a temporary loan of £1,300,000, in order to pay the Metropolitan Electric Supply Company, on the 30th inst., the sum necessary to obtain the transfer of the business, under the award of the Arbitrator and the various judgments of the Court. Arrangements have been made with the London and Westminster Bank to advance the sum of £500,000 from June 30 to Oct. 20, and four private lenders have agreed to provide the remaining £800,000, less interest, till the last-named date, when the money is to be repaid. Out of the money so borrowed the Council propose on the 30th inst. to pay the sum of £50,000 into the High Court, in accordance with the order of Aug. 7, 1903 (being part of the sum of £1,212,000 payable to the Company by the award), together with the remainder of the money then due and payable. The Council are about to enter into an agreement with the Metropolitan Electric Supply Company for the supply by the latter of electricity within the Marylebone area until March 31, 1905, up to which date the Company will furnish the entire supply, and thereafter the consumers will be taken over by the Council gradually as they are in a position to supply them from their own generating station, the supply by the Company to cease entirely not later than March 31, 1906.

THE

PARKINSON

"CROWN"

COOKER

SHOWING HOT-PLATE

HINGED TO FACILITATE

CLEANING OF BURNERS, &c.

PARKINSON AND W. & B. COWAN, LTD.
(*Parkinson Branch*),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Winchcombe Gas Company, Limited.—The annual meeting of this Company was held on Thursday. The accounts for the year 1903 showed that the income had been £646, against £540 the previous year, and that coal cost £230 only, against £275. The expenditure came to £608, and the profit of £38 was ordered to be used to help wipe off the old debts, which are gradually being liquidated, and Mr. H. P. Maybury, the Honorary Secretary, confidently predicted that in twelve months' time the Company would be free from debt and become dividend earning. If it had not been for old liabilities, the actual trading account last year would have shown a profit of £81. Mr. Maybury's resignation of the honorary secretaryship was received, with many thanks for his past services; and Mr. A. H. Darke, of Malvern, was elected in his place.

The Richmond Gas-Stove Competition.—The Richmond Gas Stove and Meter Company inform us that the result of the Competition which was recently advertised has excited a considerable amount of interest. In all, they received 1363 replies, and of these there were 1153 correct answers; but it shows the amount of research that people made to obtain a reply, when it is mentioned that there were no less than forty different titles applied to the picture forming the subject of the Competition. The correct answer was Crusader. 114 gave the name of Cavalier, 22 Conqueror, and the remainder other names. Some of the competitors did not include their names or addresses, and therefore the Company do not know where to send the Cookery Book which was promised to the competitors who were not fortunate enough to have their letter opened first on the day arranged. The winner of the stove was Mr. F. Robinson, Town Hall, Clacton-on-Sea.

Barnoldswick Gas Supply.—The annual report recently presented by the Manager (Mr. J. W. Thompson) to the Gas Committee of the Barnoldswick Urban District Council was highly satisfactory reading; the results obtained being a considerable advance on any previous year. The coal carbonized was 2705 tons; and the gas made, 28,592,500 cubic feet—the make per ton being 10,569 cubic feet. The unaccounted-for gas equalled 4·3 per cent.; this being the lowest since the works came into the hands of the Council. The net profit exceeded all expectations; being double that of any other year. The make of gas was a "record;" being 300 cubic feet per ton of coal more than had formerly been produced. The Manager recommended a reduction of 2d. per 1000 cubic feet as from the 1st of April; and this was agreed to by the Council. At the meeting of this body on the 15th inst., a suggestion was made that the question of the reduction in price should be referred back to the Committee, with the view of making it 5d. per 1000 cubic feet; but the matter was deferred till the end of the quarter.

The whole of the gas cooking apparatus used at the recent Royal Agricultural Show, held at Park Royal, was supplied by the Davis Gas Stove Company, Limited; and we understand that Mr. W. E. Wood (the head of the Catering Syndicate) says that "it gave him entire satisfaction from first to last."

The tender of Messrs. Henry Balfour and Co., Limited, of Leven, Fifeshire, for the erection of a telescopic gasholder, with a steel tank 85 feet in diameter, has been accepted by the Bridge-of-Allan Gaslight Company. They have also ordered from the firm an annular brush washer-scrubber and tar-extractor for their new works.

A new catalogue of their condensing plants is being issued by the Blake and Knowles Steam Pump-Works, Queen Victoria Street, E.C. It is fully illustrated, and contains, in addition to particulars in regard to the firm's specialities, some useful information as to steam and steam-engines, a general telegraphic code, and an index.

Messrs. Robert Dempster and Sons, Limited, of Elland, have received the order for a steel tank 63 ft. 9 in. diameter, and 20 ft. 6 in. deep, and single-lift gasholder prepared for telescoping, from the Royston Gas Company. The work is to be carried out under the supervision of the Company's Engineer, Mr. R. Porter, of Elland.

The James Keith and Blackman Company, Limited, have just issued their catalogue for the current year, which gives particulars of a number of new fittings which have lately been placed upon the market. A loose sheet accompanying it furnished the prices of their burners for use with ordinary pressures of gas. The Company are also sending out an illustrated pamphlet giving an outline of the Keith light and its applications, which, with the catalogue, gas companies will find useful for show-room purposes and for distribution.

The Winchester Water and Gas Company (for whom Messrs. Corbet Woodall and Son are the Consulting Engineers, and under whose direction the work is to be carried out) have placed with Messrs. Samuel Cutler and Sons, of Millwall, a contract for the construction of a set of purifiers for their new works, to be fitted up with the Jäger system of grids, for which Messrs. Cutler are the sole licensees in this country. Among other contracts now in hand for these grids, are installations at Chester, Southend, Rochester, and Hull.

One of the most attractive booklets ever produced for the information of gas consumers is that issued by the Commercial Gas Company, bearing the title of "The Light that Never Failed." It sets forth in pithy sentences, presented in a most artistic style, the great advantages of gas, whether it is used for lighting, heating, or the production of power; and it indicates how those who have not realized them may do so with the Company's assistance. A significant feature is the table of discounts allowed, which shows that very liberal terms are offered in the case of gas-engine supplies.

A party of Messrs. W. Sugg and Co.'s workmen had an unpleasant adventure last week, while employed in the subway under the new thoroughfare from Holborn to the Strand. The presence of gas suddenly made itself felt to such an extent that a retreat became necessary; and three of the men promptly escaped into the open air. The remaining two, however, made for another exit, and were overpowered before they could reach safety. No time was lost in effecting a rescue; and, amid considerable excitement, the men were hauled up, and despatched to King's College Hospital, where they happily recovered in the course of the day.

INTERNATIONAL GAS EXHIBITION, EARL'S COURT, 1904.

POSTER COMPETITION

The Advisory Committee offer a Prize of Five Guineas for a suitable Poster,

CONDITIONS OF COMPETITION.

1.—Sketches must be of the full size of a sheet of paper such as is commonly used for this purpose in England—"Double Crown," 30-in by 20-in; "Double Demy," 35-in. by 22½-in.; or "Double Royal," 40-in. by 25-in. Or, if intended to be made up of several such sheets, the design may be drawn on a reduced scale, which must show every detail and tint.

2.—Designs must be fully lettered with all the essential particulars of a public notice of the exhibition, such as the name, place, dates, hours, price of admission, as in the Prospectus, and give prominence to a motto, or pertinent statement concerning the exhibition, calculated to arrest attention and attract visitors. Specimens of such lines are: "The Best Light on Earth;" "The Home Beautified;" "The Servant Question Answered;" "Economy in House-keeping." Any suggestion of this kind from designers will be appreciated. The effectiveness of the Poster as an appeal to the public will be chiefly regarded.

3.—The Poster should require only one printing; but two or three colours will not exclude, if the effect is otherwise approved of.

4.—A Prize of 3 guineas will be awarded to the designer of the best poster, and two other prizes of 1 guinea each to the second and third, if deemed deserving. The premiated designs will remain the absolute property of the Committee of the exhibition, to do as they please with. The Committee do not bind themselves to make any award.

5.—Designs for this Competition must be received by the Organizers, at the offices of the exhibition, 119 to 125, Finsbury Pavement, by July 30 next. They must be enclosed in a sealed envelope marked "Design for Poster," and bear a distinguishing pseudonym, which must also be written on an enclosed sealed envelope containing the name and address of the designer.

6.—The decision of the Committee in regard to everything connected with this Competition is to be taken as absolute and final. The Committee will not be responsible for the safe keeping or return of any designs or papers sent to them.

THE ORGANIZING MANAGERS.

OFFICES:

119-125, FINSBURY PAVEMENT, LONDON, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Horncastle Gas-Works. Applications by July 6.
ASSISTANT-MANAGER. Lancaster Gas Department. Applications by July 5.
REPRESENTATIVE. "Refractory," care of Streets, Cornhill.
DRAUGHTSMAN (Estimating). Ashmore, Benson, Pease, and Co., Stockton-on-Tees.
DRAUGHTSMAN. No. 4228.
WORKING FOREMAN. Carnarvon Gas-Works. Application by July 2.
FOREMAN FITTER. Sunderland Gas Company.

Agent Wanted for Oxide. Deacon's, Leadenhall Street, E.C.

Situations Wanted.

ACCOUNTANT OR CHIEF CLERK. No. 4220.
AGENCY. No. 4227.
ASSISTANT-MANAGER. No. 4178.
CLERK AND BOOK-KEEPER. Bowd, Tamworth.
MAIN AND SERVICE LAYER. Moat, Featherstone.

Plant, &c., for Sale.

EXHAUSTER AND ENGINE, HYDRAULIC MAINS, &c. Bangor Gas-Works.
PURIFIERS. Neston Gas-Works.

Plant Wanted.

ANNULAR CONDENSERS. No. 4226.

Company Meeting.

EUROPEAN GAS COMPANY. Offices, July 12. 2.30 o'clock.

Stocks and Shares for Sale.

BARNET GAS AND WATER COMPANY. July 5.
NORTH MIDDLESEX GAS COMPANY. July 5.
SEVENOAKS WATER COMPANY. July 23.

TENDERS FOR

Coal and Cannel.

BETHESDA GAS DEPARTMENT. Tenders by July 9.
BRADFORD GAS DEPARTMENT. Tenders by July 13.
BROADSTAIRS GAS COMPANY. Tenders by July 12.
DEWSBURY GAS DEPARTMENT. Tenders by July 13.
EXMOUTH GAS COMPANY. Tenders by July 2.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by June 30.
ILKESTON GAS DEPARTMENT. Tenders by July 5.
MALTON GAS COMPANY. Tenders by July 2.
NEWPORT (MON.) GAS COMPANY. Tenders by July 4.
WHALEY BRIDGE GAS-WORKS. Tenders by July 6.

Meters.

DEWSBURY GAS DEPARTMENT. Tenders by July 13.

Pipes, &c.

DEWSBURY GAS DEPARTMENT. Tenders by July 13.

Purifiers, &c.

PENRITH GAS DEPARTMENT. Tenders by July 6.

Sulphuric Acid.

DEWSBURY GAS DEPARTMENT. Tenders by July 13.

Tar and Ammoniacal Liquor.

ALTRINCHAM GAS COMPANY. Tenders by July 12.
GUILDFORD GAS COMPANY. Tenders by June 29.
ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY. Tenders by July 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND Co., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
MELROSE CYCLE COMPANY, COVENTRY.

JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

COAL GAS TAR wanted.
ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SFONDON.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND Co., 96 & 98, Leadenhall Street, LONDON, E.C.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND Co., CENTRAL PLUMBING WORKS, BOLTON.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND Co., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS TAR wanted.
BROTHERTON AND Co., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

APPOINTMENT Wanted as Account- ANT or CHIEF CLERK in a Gas or Gas and Water office. Over Twelve Years' Experience. First-class Testimonials.
Address No. 4220, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Man (Age 22) requires Situation as Main and Service Layer. Willing to make himself generally useful.
Address, CHAS. MOAT, Gas-Works, Featherstone, PONTEFRACT.

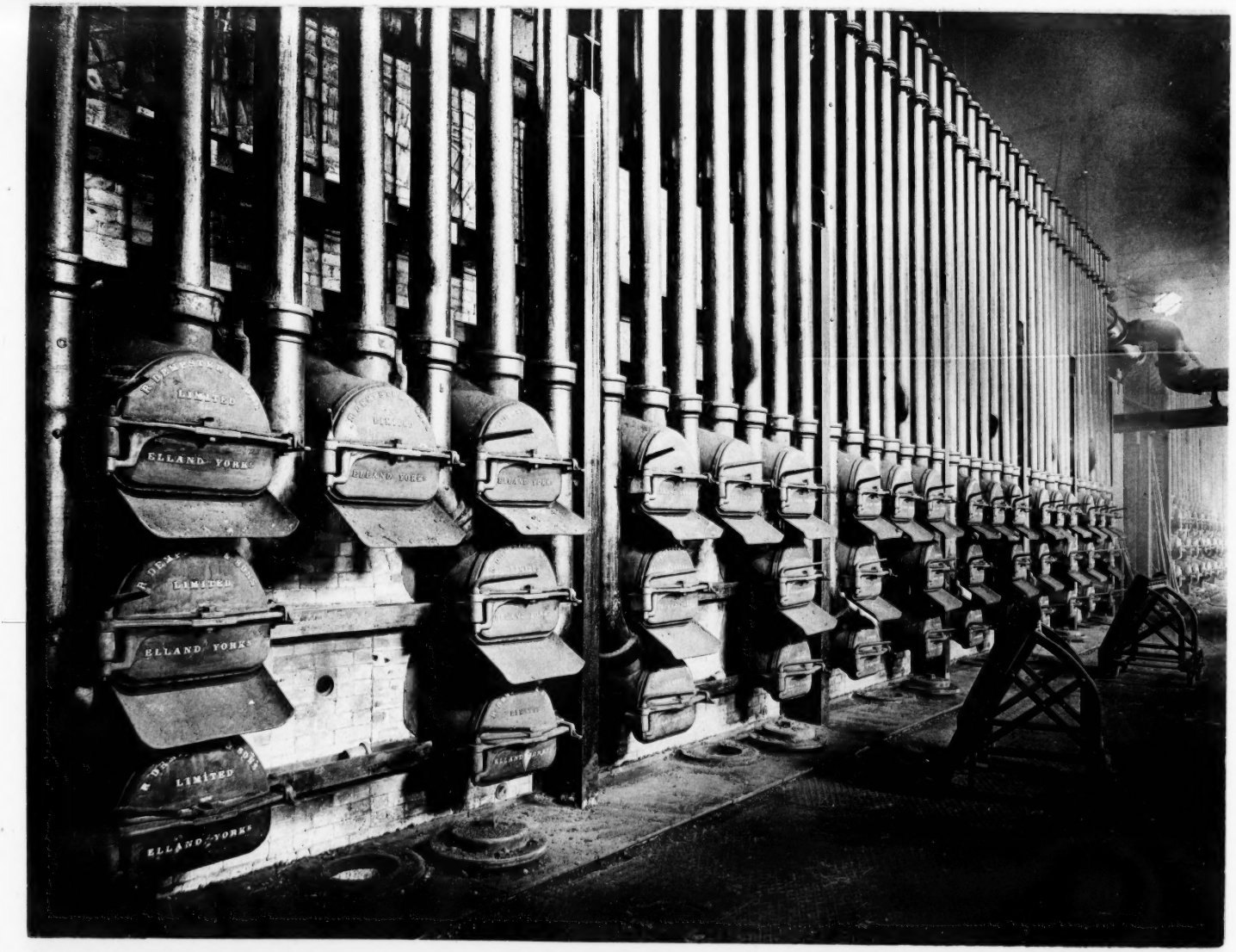
WANTED, by a Young Man (aged 24, married), a situation as Clerk and Book-Keeper. Several years' Experience of Gas-Works Accounts, especially Gas-Rental. Good References from past and present employers.
Address S. BOWD, Gas-Works, TAMWORTH.

LONG EATON GAS COMPANY.

GENERAL ASSISTANT.

THE 109 Applicants herein are cordially THANKED. A Selection has been made, and Candidates have been written to accordingly.
G. STEVENSON,
Secretary and Manager.

AGENTS wanted by an Old-Established firm to sell Oxide of Iron in Lancashire and Scotland. Must have a good Connection among Gas Companies.
Apply, by letter, with full Particulars, References, and Terms expected, to "OXIDE AGENT," care of Messrs. Deacon's, LEADENHALL STREET, E.C.



Chesterfield Gas and Water Board.

W. T. Buckland. Engineer.

DRAWING FLOOR OF INCLINED RETORT HOUSE,

6 ARCHES ERECTED IN 1898. REPEAT ORDER FOR 6 ARCHES ERECTED IN 1903 BY

ROBERT DEMPSTER & SONS LTD., ELLAND, YORKS.

Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 28th, 1904.

Collotype by Waterlow & Sons Ltd.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

ADVERTISER wishes for an Agency in London and District for General Gas Plant. A good Connection.
Address No. 4227, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

APPOINTMENT wanted as Assistant-MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works Routine. Honours Gas Manufacture.
Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE wanted for the sale of Special Refractory Cement for Gas-Retorts and other Gas-Works purposes. Must have necessary Connection and be a pushing Salesman.
Apply, with full Particulars, References, Age, and Terms expected, to "REFRACTORY," care of Street's, 30, CORNHILL, E.C.

ESTIMATING Draughtsman for General Engineering Establishment. Knowledge of Gas-Works Construction preferred.
State Age, Experience, and Salary to ASHMORE, BENSON, PEASE, AND CO., LTD., STOCKTON-ON-TEES, endorsed "Draughtsman."

WANTED, at once, a good Draughts-man, for a few Months. One used to Gasholders and Ironwork construction generally. Salary £2 10s. per week.
Apply, by letter, to No. 4228, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SUNDERLAND GAS COMPANY.

WANTED, a Foreman Fitter for the Company's Hendon Gas-Works. He must have had a thorough Mechanical Training and possess a good Practical Knowledge of Gas Plant, including Power Stoking Machinery. Preference given to one occupying a similar position. Age 30 to 40. Wages 48s. per week.
Apply, by letter, in own hand-writing, stating Experince, whether Married or Single, and enclosing *copies* of not more than Three Testimonials, to The MANAGER, Hendon Gas-Works, SUNDERLAND.

CARNARVON CORPORATION GAS-WORKS.

WANTED, a Working Foreman for the Gas-Works. Wages 28s. per week, with House, Coal, and Gas free. Particulars from the undersigned.
Applications to be sent in not later than July 2, addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon. The names of three References are to be given.

WILLIAM M. RUXTON,
Manager.

Gas Office, Guildhall,
Carnarvon.

HORNCASTLE URBAN DISTRICT COUNCIL GAS-WORKS.

THIS Council are prepared to receive APPLICATIONS for the post of MANAGER of their Gas-Works.
Salary, £120 per annum, with House, Coals, and Gas.
Applicants not to be under the Age of 25 or over 40.
Applications, in Candidates own hand-writing, endorsed "Gas Manager," stating Qualifications and previous Experience, with *copies* of not less than Three recent Testimonials, must be sent in so as to reach me on or before Wednesday, the 6th day of July next.
The Candidate appointed must give satisfactory Security for the discharge of his duties, devote the whole of his time to the work, and will be required to enter on his duties on the 1st day of September, 1904.

H. TWEED,
Clerk to the Council.

6, Lindsey Court, Horncastle,
June 17, 1904.

LANCASTER CORPORATION.
(GAS DEPARTMENT.)

ASSISTANT-MANAGER.

THE Corporation Gas Committee invite APPLICATIONS for the position of ASSISTANT GAS MANAGER.
Applicants must have a knowledge of Drawing, Chemistry, and the General Routine of the Manufacture, Purification, and Distribution of Gas. Salary £100 per annum.
Applications, endorsed "Assistant Gas Manager," Stating Age and Experience, accompanied by *copies* of not more than Three recent Testimonials, to be delivered to the undersigned not later than Tuesday, the 5th of July, 1904.

T. CANN HUGHES,
Town Clerk.

Town Hall, Lancaster,
June 21, 1904.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.
New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

WANTED, a Set of Six Annular Condensers (Second-Hand), in good condition, 4 ft. 6-in. by 40 ft. 18-inch Connections.
Address No. 4226, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Two 6 feet by 6 feet Puri-FIERS, by Dempster, with two Four-Way Valves. Replaced by larger
Apply to A. E. ASHLEY, Manager, Gas-Works, NESTON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GAS PLANT FOR SALE.

THE Corporation of Bangor, North Wales, have the following PLANT for Sale:—
One 10,000 feet per hour EXHAUSTER, with STEAM-ENGINE on one Bed-Plate.
Two lengths of HYDRAULIC MAIN, with 7-inch Valves, 5-inch H Pipes, and 6-inch to 5-inch Ascension Pipes.
The Engine may be seen in use.
Further Particulars may be had on application to the undersigned.

JOHN SMITH,
Manager.

June 10, 1904.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

THE Haworth Urban District Council are prepared to receive TENDERS for the supply of 2500 Tons of GAS COAL (Screened, Unscreened, and Gas Nuts) delivered at Haworth Railway Station during the ensuing Twelve Months.
Sealed Tenders, endorsed "Gas-Coal Tender," may be forwarded to me the undersigned not later than the 30th inst.

WILLIAM ROBERTSHAW,
Clerk.

1, Burlington Chambers,
North Street, Keighley.

TENDERS FOR COAL.

THE Directors of the Malton Gas Com-pany are prepared to receive TENDERS for the supply of about 4500 Tons of D. S. GAS NUTS, to be delivered at Malton Station in the Twelve Months ending the 30th of June, 1905.
Particulars may be obtained of the undersigned.
Tenders to be sent in on or before Saturday, the 2nd of July next.

HENRY TOBEY,
Engineer and Secretary.

Malton, Yorks., June 18, 1904.

ROCHESTER, CHATHAM, AND STROOD GASLIGHT COMPANY.

TAR.

THE Directors are prepared to receive TENDERS for TAR to be produced at their Works at Rochester and Gillingham for One Year commencing July 1 next.
The quantity will be about 300,000 Gallons, and will include Carburetted Water-Gas Tar.
Further Particulars, with Form of Tender and Contract, may be had on application, and no Tender will be considered unless on the Form supplied by this Company.
Sealed Tenders, endorsed "Tar," must be delivered to me at these Offices not later than noon of Wednesday, July 6, 1904.
The Directors do not undertake to accept the highest or any Offer, and security for the due fulfilment of the Contract must be given if required.

J. M. VEEVERS,
Engineer and General Manager.

Gas Offices, Rochester,
June 23, 1904.

EXMOUTH GAS COMPANY.

THE Directors of the Exmouth Gas Company invite TENDERS for the supply of 4500 to 5000 Tons of Best GAS COAL (screened or unscreened) to be delivered in such quantities and at such times as may be required from the 1st of August, 1904, to the 31st of July, 1905, and to weigh 20 cwt. to the Ton over the Gas Company's or Dock Company's weighbridge (the said machines are regularly inspected by the Officer under the Weights and Measures Act), the Coal to be fresh wrought, dry, and free from Hards, Smudge, Dirt, Shale, and Pyrites.
Tenders to be accompanied by practical working analysis. Prices may be quoted c.i.f. or f.o.b. Exmouth Docks (by Sailing Vessel only), or f.o.r. Exmouth Railway Station (L. & S.W. Railway).
Sealed Tenders, endorsed "Tender for Coal," to be addressed to J. Palmer, Esq., Chairman, and delivered to the undersigned not later than Saturday, the 2nd day of July, 1904.
The Directors do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.

JAMES T. FOSTER,
Secretary and Manager.

Gas-Works, Exmouth,
June 9, 1904.

TENDERS are invited for the supply of 600 to 700 Tons of best screened GAS COAL, to be delivered at Whaley Bridge Station as required during the Year ending July 31, 1905.
Sealed Tenders, endorsed "Coal," to be delivered at the Company's Office on or before Wednesday, July 6, 1904.

WILLIAM SCHOLES,
Secretary.

Gas Offices, Whaley Bridge, nr. Stockport,
June 18, 1904.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply of 6000 Tons of Best Newcastle GAS COAL, to be delivered at the Harbour, Broadstairs.
Forms of Tender, or further Particulars, may be obtained from the undersigned.
Sealed Tenders, endorsed "Gas Coal," to be sent in, addressed to the Chairman, on or before July 12, 1904.
The Directors do not bind themselves to accept the lowest or any Tender.

F. HIGGINSON,
Engineer, Secretary, and Manager.

Gas Office, Broadstairs,
June 20, 1904.

CORPORATION OF ILKESTON.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for 10,000 Tons of GAS COAL, NUTS, or CANNEL, to be delivered as required at the Gas-Works Siding, Midland Railway.
The Tenders must be on the usual Forms, which are to be had on application at the Gas Office.
Sealed and endorsed Tenders to be sent to Wright Lissett, Esq., Town Clerk, not later than July 5, 1904.
The Committee do not pledge themselves to accept the lowest or any Tender, and reserve their right to divide the quantity.

F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
June 18, 1904.

GAS COAL.

THE Bethesda Urban District Council are prepared to receive TENDERS for the GAS COAL required at their Gas-Works during the ensuing Year, in such quantities and at such times as may be required (in all about 300 Tons) from the 1st of August, 1904, to the 31st of July, 1905.
Tenders to state Price per Ton, and be accompanied by an Analysis of the Coal.
The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his contract.
The lowest or any Tender not necessarily accepted.
The Tenders to be sent in on or before the 9th day of July, 1904.

D. GRIFFITH DAVIES,
Clerk and Solicitor.

Council Offices, Bethesda,
June 18, 1904.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the supply of best GAS COAL, COBBLES, NUTS, and CANNEL, all to be well screened, dressed, and free from Shale and Pyrites, to be delivered at the several Works of the Corporation during the period of One Year, commencing on the 1st day of August next.
Form of Tender, with any further Information required, may be had on application to Mr. Chas. Wood, Gas Engineer, Town Hall.
Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Wednesday, the 13th of July next.
The Contracts will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign.
The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
June 13, 1904.

PENRITH URBAN DISTRICT COUNCIL.

GAS-WORKS PURIFIERS AND GENERAL ALTERATIONS.

THE above-named Council are prepared to receive TENDERS for the supply and erection of a set of 3 PURIFIERS (Green's principle), with Superstructure, Elevators, &c., Supply and Fixing of Mains, Valves, and Connections, and the Removal and Re-erection of Plant generally.
Specifications, Forms of Tender, and General Conditions can be obtained from the undersigned on payment of Two Guineas, which amount will be returned on receipt of a *bonâ-fide* Tender.
Plans may be seen at the Office of the Engineer and Manager, Mr. E. Shaul, Gas-Works, Penrith, and prints thereof will be furnished on payment of a Guinea, which will not be returned.
Tenders on the prescribed Form, endorsed "Purifiers, &c.," must be delivered to the undersigned not later than Twelve o'clock noon on the 6th day of July, 1904.
The Council do not bind themselves to accept the lowest or any Tender.

By order,
GEORGE WAINWRIGHT,
Clerk of the Council.

Public Offices, Penrith,
June 23, 1904.

ADVERTISEMENT SUPPLEMENT TO THE "JOURNAL OF GAS LIGHTING, &c.—JUNE 28th, 1904.

NEWPORT (MON.) GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for the supply of about 32,000 Tons of best GAS COALS for the period of One Year from the 1st of August next, to be delivered on the Company's Sidings at their Mill Street or Crindau Works in such quantities and at such times as may be directed by the Company's Engineer, from whom further Information may be obtained.

Tenders will be received for the whole or part of the above quantity.

Tenders, endorsed "Coals," to be delivered at the Offices of the Company not later than Monday, July 4, 1904.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
T. H. HAZELL,
Secretary.

Newport (Mon.), June 17, 1904.

ALTRINCHAM GAS COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company invite TENDERS for the surplus TAR produced at their Works between the 1st of July next and the 30th of June, 1905.

Estimated Quantity, 1000 Tons.

Delivery into Contractor's or Gas Company's Tank-Waggons at Altrincham Station or in Contractor's Barrel Carts at the Gas-Works.

Sealed Tenders, addressed to the Chairman and endorsed "Tender for Tar," to be delivered not later than Tuesday, the 12th of July.

The Directors do not bind themselves to accept the highest or any Tender.

No special Form of Tender.

J. E. LAMB,
Manager.

Gas Offices, Altrincham,
June 21, 1904.

BOROUGH OF DEWSBURY.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply and delivery during the period ending the 31st day of July, 1905, of:—

(1) SULPHURIC ACID.
(2) Wet and dry GAS-METERS,
(3) Cast-Iron GAS and WATER PIPES.

Specification and Forms of Tender may be obtained on application to the Gas Engineer, Mr. Chas. A. Craven, Gas-Works, Savile Town, Dewsbury.

Tenders, under sealed covers, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes," as the case may be, to be sent to me not later than Wednesday, the 13th day of July next.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Hall, Dewsbury,
June 24, 1904.

BOROUGH OF DEWSBURY.

THE Gas Committee are prepared to receive TENDERS for the supply and delivery at their Gas-Works Siding, Savile Town, Dewsbury, of the following quantities of Screened GAS COAL during One, Two, or Three Years, commencing on the 1st day of August next.

First year, 20,000 Tons of Black and 2000 tons of Cannel.
Second year, 20,000 Tons of Black and 2000 Tons of Cannel.
Third year, 20,000 Tons of Black and 2000 Tons of Cannel.

Tenders must specify for delivery by rail, and to be made on Forms to be had on application to Mr. Chas. A. Craven, Savile Town Gas-Works, Dewsbury, from whom any further Information can be obtained.

Sealed Tenders, endorsed "Tenders for Coal," to be sent to me not later than Wednesday, the 13th day of July next.

The Committee do not bind themselves to accept the lowest or any Tender.

H. ELLIS,
Town Clerk.

Town Clerk's Office, Town Hall,
Dewsbury, June 24, 1904.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 12th day of July next, at 2.30 p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are Henry C. Smith, Esq., and Robert Hesketh Jones, Esq., and the retiring Auditors are J. Reeson, Esq., and A. T. Eastman, Esq., who, being eligible for re-election, offer themselves accordingly.

The Accounts to be submitted to the Shareholders will be opened for inspection at the Company's Offices on and after the 7th of July next.

Notice is Also Given, that the TRANSFER BOOKS WILL BE CLOSED from the 13th to the 29th of July next, both days inclusive.

By order of the Board,
W. WILLIAMS,
Secretary and General Manager.

Finsbury House, Blomfield Street,
London, E.C.,
June 27, 1904.

In accordance with Clause 12 of the Company's Regulations,—

"The Bearer of a Share Warrant may, on depositing his warrant at the Chief Office of the Company in London, not later than 48 hours before holding any meeting of the Company, be present and vote at any such meeting in respect of the Shares or Stock included in such Warrant."

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to Capital Stocks, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 5th day of July next, and will be RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on the 5th day of August next.

By order,
H. RAYNER,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., June 23, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

BARNET DISTRICT GAS AND WATER COMPANY.

£800 "A" AND "C" CAPITAL STOCK AND £1100 "D" CAPITAL GAS STOCK.

MR. ALFRED RICHARDS, will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 5, at Two o'clock in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

NORTH MIDDLESEX GAS COMPANY.

NEW ISSUE OF £3000 FOUR PER CENT.

PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SEVENOAKS WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the Sevenoaks Water-Works Company, in pursuance of their Provisional Order of 1900, as confirmed by Act of Parliament, being desirous of increasing their Capital, have resolved to issue

THREE HUNDRED AND FIFTY 4 PER CENT. PREFERENCE SHARES OF £10 EACH.

Tenders are Hereby Invited from the Public for the same, at not less than par value.

The present issue of capital is made to provide for an additional Pumping Plant, new Reservoirs, and new Mains at Seal Chart, Stone Street, and Bitchet.

The Company are now paying the maximum dividend on their Stock and Share Capital.

The Shares are payable as under—viz.:
£2 on Application,
£3 on Allotment,
and the Balance within Three Months of Allotment.

Tenders are to be addressed to the Company, at their Offices, Oak Lane, Sevenoaks, on or before the 23rd day of July, 1904, and endorsed "Tender for Shares."

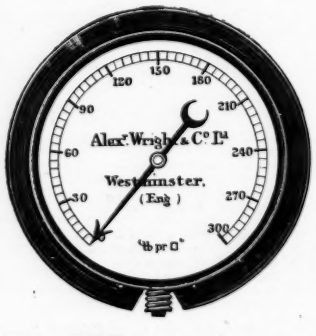
Where no allotment is made, the deposit will be returned in full.

Forms of Tender on application at the Company's Offices.

By order of the Board,
ALFRED GRAINGER,
Secretary

Water-Works Offices, Oak Lane,
Sevenoaks, June 13, 1904.

STEAM, OIL, and WATER.



Any Range of Pressure.

Price 15s., Limp Cloth,

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES

Compiled by

WOOD, DREW, & CO.,

Chartered Accountants.

WALTER KING, 11, Bolt Court, FLEET STREET, E.C

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THE

PETROLEUM GAS SYNDICATE

Supply and erect Complete Installations of their

PETROGENE PATENT GAS PLANT

On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

TROTTER, HAINES, & CORBETT, LIMITED,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

RAILS.

New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

B. M. RENTON,

MIDLAND WORKS,

SHEFFIELD.

THE

"ROTARY"

STATION METER.

Efficiency Demonstrated.

APPLY—

T. G. MARSH,

MAWSON CHAMBERS, DEANSGATE,

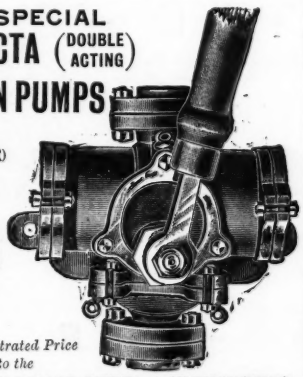
MANCHESTER.

CASES FOR BINDING
QUARTERLY
VOLUMES OF THE "JOURNAL."
(Green Cloth, Gilt Lettered).
Price 2s. each.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

Just Published. Crown 8vo, 6s. Cloth.
GAS-WORKS
THEIR
CONSTRUCTION AND ARRANGEMENT
And the Manufacture and Distribution of Coal Gas.
By S. HUGHES, C.E.
Ninth Edition, Revised, with Notices of Recent Improvements.
By HENRY O'CONNOR, A.M.Inst.C.E.,
Author of the "Gas Engineer's Pocket Book."
London: CROSBY LOCKWOOD & SON,
7, Stationers' Hall Court, E.C.

SPECIAL
PERFECTA (DOUBLE ACTING) PISTON PUMPS
HAND OR POWER)
FOR
Tar and Ammoniacal Liquor, &c.



Send for Illustrated Price List to the
GEORGE FISCHER STEEL & IRON WORKS,
20, HIGH HOLBORN, LONDON. LTD.,

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

REDUCE EXPENSES. INCREASE PROFITS by doing your own Whitewashing or Limewashing.
THE
"EVERTRUSTY"
Pneumatic Painting, White and Limewashing Machine.

Cost from £3 10s. to £12 10s.

"A" size replaces 25 men.

Extract from a Recent Inquiry: "I have seen the Machine which you supplied to the Bradford Road Gas-Works, Manchester, with which the Manager there is very highly pleased."
Full Particulars on application to—
WALLACH BROS.,
57, GRACECHURCH STREET, LONDON, E.C.

PRICE'S COKE & COAL BARROW

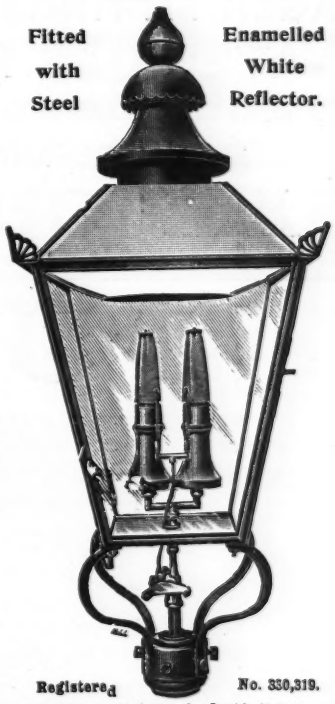
effects a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

SAVE MONEY LABOUR
Imperial Cookers give no trouble, and for quality and cheapness cannot be excelled.
TWO GOLD MEDALS
in Six Months.
Our Gas-Cooker Orders last Year were
455 % (per cent.)
more than in 1902.
THE IMPERIAL STOVE CO.,
LEAMINGTON SPA.
Telegrams: "Imperial, Leamington."
Telephone: One X.

THE
"KILBURN" LANTERN.
Fitted with Steel
Enamelled White Reflector.



Registered No. 330,319.
The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.
H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

"Invaluable to those engaged in lighting works."—ENGINEERING.
Now Ready. Twenty-Seventh Year of Issue. Revised to June, 1904.
GAS-WORKS DIRECTORY & STATISTICS,
FOR 1904.
With List of Associations and Alphabetical List of Chairmen, Engineers, Managers, and Secretaries.
Price, Cloth, 10s. 6d. Net.
SEND FOR PROSPECTUS AND SPECIMEN PAGE.
LONDON: HAZELL, WATSON, & VINEY, LD., 52, LONG ACRE, W.C.

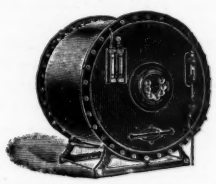
TELEGRAPHIC ADDRESS:— "FITZMAURICE, LONDON." TELEPHONE NO. 11,113 CENTRAL.

ROBERT B. FITZMAURICE,
4, East India Avenue, London, E.C.
Shipping, Insurance, and Chartering Agent for several Foreign Gas Companies, Municipalities, and Gas Plant Manufacturers.
FORWARDS GOODS TO ANY PORT FROM ANY TOWN IN U.K.
Quotations if desired, & Orders promptly executed.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

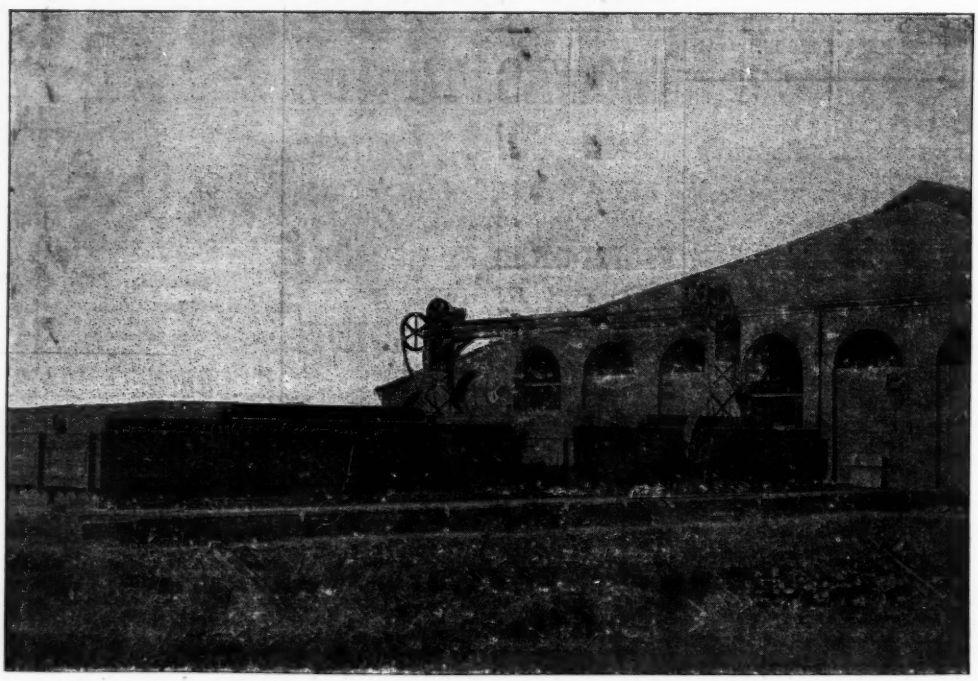
HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.



GASHOLDERS OF EVERY DESCRIPTION.
SPIRAL GUIDED. — STANDARD GUIDED. — COLUMNLESS.
STEEL TANKS FOR GASHOLDERS OR OIL STORAGE.
WATER-TUBE CONDENSERS — OVER 130 IN USE.
JÄGER FITTINGS WHICH DOUBLE THE CAPACITY OF PURIFIERS.
WATER-GAS PLANT, CARBURETTED OR BLUE.
STEEL BUILDINGS, ROOFS, CHIMNEYS, PIPES.
EVERY REQUIREMENT FOR GAS AND WATER WORKS.
SAML. CUTLER & SONS, MILLWALL, LONDON.
No. 167.

PURIFIERS.



W. C. HOLMES & CO., HUDDERSFIELD.

F'cap. Fol., 28 *pp.*, 2 *Plates, and* 43 *Illustrations, Bound in Duplex Paper Cover*
Price 2*s.* 6*d. net, post free.*

A DESCRIPTION
OF THE
ZURICH NEW GAS-WORKS.
By A. WEISS, Engineer of the Works.
Translated from the German for, and Reprinted from, the "JOURNAL."

London: WALTER KING, 11, Bolt Court Fleet St., E.C.

THE SANITARY PUBLISHING CO. LTD.

PUBLIC LIGHTING BY GAS AND ELECTRICITY
By W. J. DIBDIN, F.I.C., F.C.S., &c.
Formerly Chemist and Superintending Gas Examiner to the London County Council. Author of "The Purification of Sewage and Water," "Lime, Mortar, and Cement," "Practical Photometry," &c.
537 pp., Cloth gilt. Price 21s. net. With numerous Illustrations, Diagrams, and Tables.

A Table for Ascertaining the
TRUE ILLUMINATING POWER OF A GAS,
DEDUCED FROM POLE'S LAWS.
Size 30 in. by 22 in. Price 21s. net.
By W. J. DIBDIN, F.I.C., F.C.S., &c.
THE SANITARY PUBLISHING CO., LTD., 5, FETTER LANE, LONDON, E.C.

WILSON CARTER & PEARSON LIMITED,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

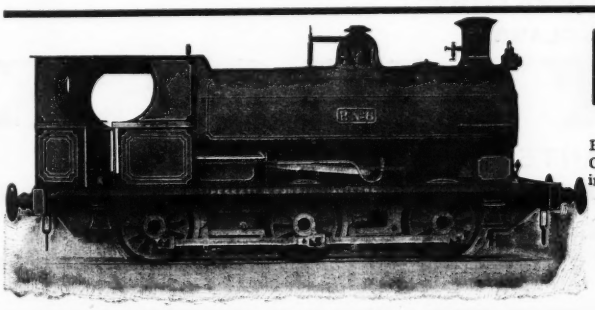
THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.
SUPPLY FROM STOCK
CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.
AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

Wrought-Iron

And Fittings & Accessories.

LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES STEAM & WATER VALVES TOOLS. &c. AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., LTD., 91 & 93, SOUTHWARK ST., S.E.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.
LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "PARKER LONDON."



LOCOMOTIVES
LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.
Photographs, Specifications, and Prices on Application.
PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**
Telegraphic Address: "PECKETT, BRISTOL."

THE DELLWIK-FLEISCHER WATER-GAS PROCESS
For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, & Manufacturing Purposes.
(PATENTS IN ALL COUNTRIES)

THIS PROCESS HAS BEEN ADOPTED AT THE FOLLOWING GAS-WORKS:—
IN ENGLAND: WEST BROMWICH, ILFORD, TIPTON, CLEETHORPES, BILSTON, RUSHDEN & HIGHAM FERRERS.
IN THE COLONIES: CAPE TOWN.
ON THE CONTINENT: KÖNIGSBERG, ERFURT, ISERLOHN, REMSCHEID, PFORTZHEIM, PLAUEN, BARMEN-RITTERSHAUSEN, NUREMBERG, MÜLHEIM A/RUHR, LUDWIGSHAFEN a/R., GÜSTROW, DORTMUND, SALZWEDEL, STUTTGART, BERLIN-MARIENDORF, BERNE, LYONS, GIJON, ROME, ARNHEIM, BRUMMEN,* OSTERFELD,* WARSTEIN,* WIBORG.*
[* Blue Water Gas with Incandescent Burners.]
ALSO FORTY INSTALLATIONS FOR MANUFACTURING PURPOSES.

THE DELLWIK-FLEISCHER WATER-GAS SYNDICATE,
25, VICTORIA STREET, WESTMINSTER, LONDON, S.W.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

Telephone No. 756 Bank. *Telegrams: "Robustness, London."*

Please Note CHANGE OF OFFICES from Rooms 388 to 390 Second Floor, to ROOMS 279, 279a, 280, 281, & 282 FIRST FLOOR

MANSION HOUSE CHAMBERS, LONDON, E.C.

INCLINES, HORIZONTAL, FLOOR LEVELS, GENERATORS, AND REGENERATORS.

HIGH-CLASS

RETORT WORK

GUARANTEED.

GENERAL GAS AND WATER WORKS CONSTRUCTORS.

MAINLAYING.

Plans & Particulars—J. & H. ROBUS, Engineering Contractors, LONDON & GORING.

D. HULETT & CO., LTD.

Show-rooms and Offices: 55 & 56, HIGH HOLBORN, LONDON.

Lamp & Meter Works: HARPUR MEWS, THEOBALD'S RD., LONDON.

MANUFACTURERS OF

OUTSIDE GAS-LAMPS

Suitable for Incandescent or Ordinary Burners.

DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.

PRICE LISTS ON APPLICATION.

GENERAL HEATING & LIGHTING CO., LTD.,
(MOELLER'S SYSTEM),
26, VICTORIA STREET, LONDON, S.W.

MOELLER'S BURNERS

MAINTENANCE SIMPLIFIED.

Nothing to Corrode. Nothing to Choke.
Nothing to get out of Order.

Made in 4 Sizes consuming, 3, 4, 4½, and 6½ feet. In Brass or Nickelled.

PRICE LIST ON APPLICATION.

PATENT "STANDARD" PURIFYING GRIDS.

Orders received for **148** Purifiers.

RECENT ORDERS: Ilford Gas Company, Barnet District Gas and Water Company, and Wadhurst and Ticehurst District Gas Company.

CAPACITY OF PURIFIERS MORE LARGELY INCREASED.

Pressure and Cost of Emptying and Filling more Largely Reduced than by any other System.

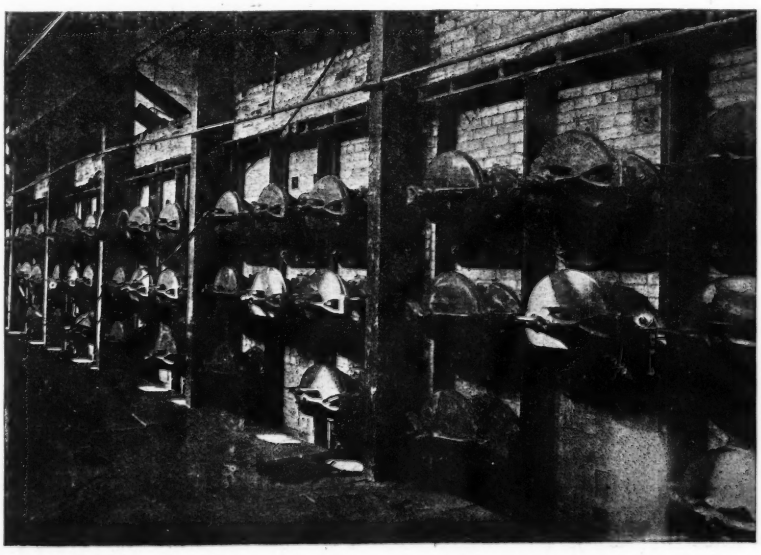
Figures from Users verifying this on application to—

KIRKHAM, HULETT, & CHANDLER, LTD. PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

INSTALLATIONS OF INCLINED RETORTS COMPLETE.

DRAKES LTD.

HALIFAX. *Telegrams:* "DRAKESON, HALIFAX." *Telephone:* "No. 43 HALIFAX."



COAL
AND
COKE
BREAKING,
ELEVATING,
CONVEYING,
SCREENING,
PLANTS.

LONDON:
181, QUEEN VICTORIA ST., E.C.
NEW YORK:
395, BROADWAY.

THE EVESON COAL & COKE Co. Ltd.

Telegrams, EVESON, BIRMINGHAM
Telephone No. 815.

134, EDMUND STREET,
Birmingham

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**
Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.
709, OLD KENT ROAD, LONDON, S.E.
Telegraphic Address: "METROGAS, LONDON."

GAS
THE WINSTANLEY SPECIALTY COY.
ENGINEERS

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.
RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS

ADDRESS—
NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**

MOBBERLEY & PERRY,
STOURBRIDGE.

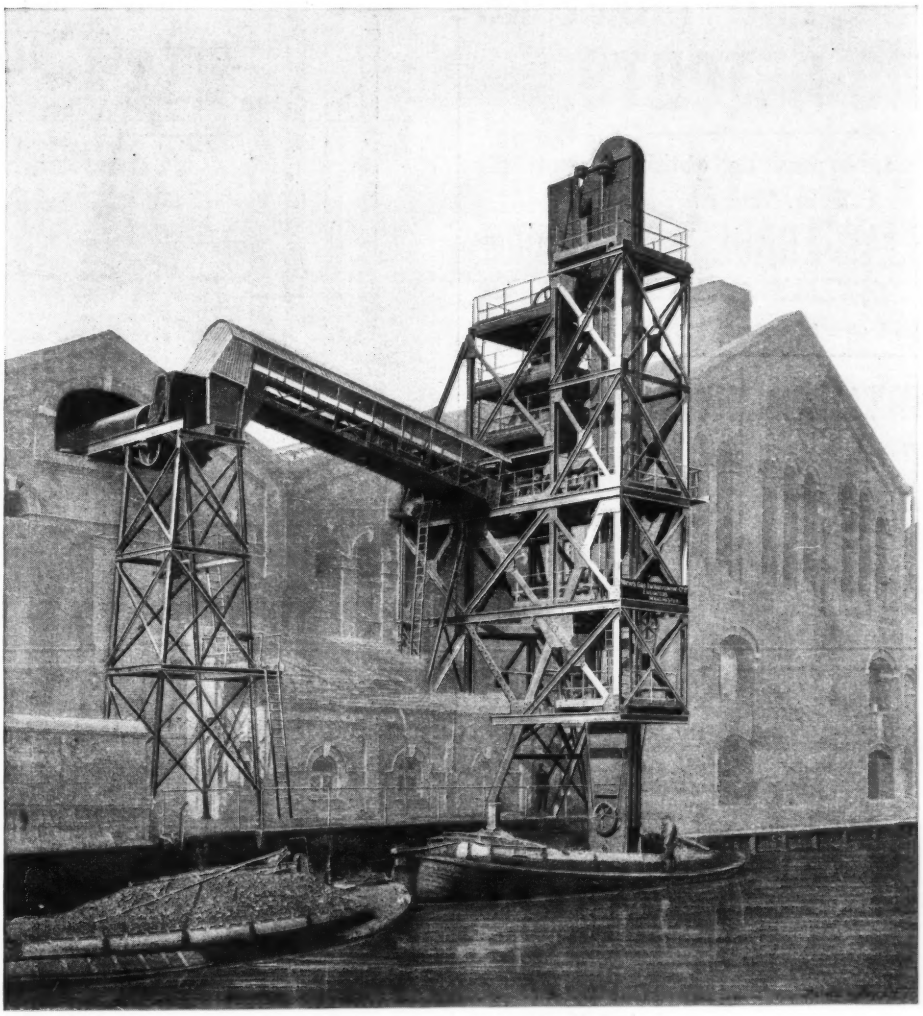
Give SPECIAL and PERSONAL ATTENTION to the execution of all orders

Bricks for Water Gas Plants and Chequer Bricks always in Stock.

INCLINED, HORIZONTAL, & SEGMENTAL RETORTS OF BEST QUALITY.

WEST'S GAS IMPROVEMENT CO., LTD.,

GAS AND GENERAL ENGINEERS.



PHOTOGRAPH SHOWING

West's Coal Handling Plant for unloading Barges, Elevating, Breaking, Automatic Weighing, Conveying and Storing the Coal in Stores.

STOKING MACHINERY SPECIALISTS

Over 140 Installations of West's Stoking Machinery now at work.

West's Patent Coke-Conveyors.
,, ,, Regenerator Settings.
General Structural Ironwork.

The Bournemouth Arch-Pipe.
Belton's Relief Apparatus for Hydraulic Mains.

ADDRESS—ALBION IRONWORKS, MILES PLATTING, MANCHESTER.

Telegrams: "STOKER, MANCHESTER." Telephone Nos. 1339 & 5520

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers.

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, June 7, p. 682.]

STARTLING INVENTION!

Carborundum Bricks, Carborundum Crucibles, &c.

DR. ENGELS' PATENT

CARBORUNDUM COATINGS

For Lining GAS-GENERATORS.

For Lining and Repairing

GAS-RETORTS.

For Metallurgical and Chemical purposes, Furnaces, and Firing Plants of all kinds.

The Fire-Proof Products Co., Ld.

Representative: **Richard Cremer,**

CIVIL ENGINEER, WOODHOUSE LANE, **LEEDS.**

THE LEEDS FIRECLAY CO., LTD.

JOSEPH CLIFF & SONS' BRANCH.

Cliff's Wortley Silica Bricks.

FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

Cliff's Wortley Aluminous Bricks.

THESE are for Side Walls where great wear and tear takes place. Are made of a specially prepared mixture, are high in Alumina, and are what is termed a HARD FIRE-BRICK.

BALTIC WHARF, WATERLOO BRIDGE, LONDON, S.E.

Liverpool: Leeds Street. Leeds: Queen Street.

J. FIRTH BLAKELEY & CO.,

Telegrams:—
"BLAKELEY THORNHILL LEES."

Gas Engineers and Contractors,

THORNHILL, DEWSBURY.

"BLAKELEY'S"

Patent Rectangular Vertical

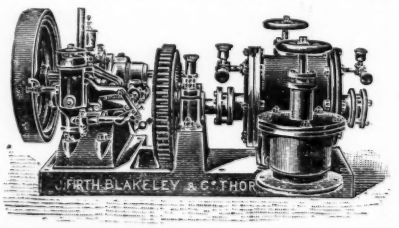
CONDENSERS,

Having Perforated Baffle Plates with Water-spreading and Cooling Arrangement.

These Condensers are already in use at several Gas-Works, and are giving every satisfaction.

QUOTATIONS, WITH FULL PARTICULARS AND DRAWINGS, SENT ON APPLICATION.

Please state maximum quantity of gas passing per hour, when enquiring.



'BLAKELEYS' IMPROVED COMBINED GAS ENGINE AND EXHAUSTER,

Specially designed to meet the requirements of small Gas-Works.

NO STEAM BOILER REQUIRED.
WEAR AND TEAR REDUCED.
MORE GAS OBTAINED FROM EACH TON OF COAL.

Full Specification, Drawings, and Quotations on application.

MECHANICAL COAL HANDLING PLANTS

OF ANY MAGNITUDE

MADE AND ERECTED BY

GIBBONS

BROTHERS LTD

DUDLEY & LONDON

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co LTD LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS ROOFS RETORT FITTINGS PURIFIERS RETORT LIDS ANTIFREEZERS for Gasholders
STEEL TANKS OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS OF EVERY DESCRIPTION & SIZE.
HIGH CLASS BOILERS FITTED WITH DEIGHTON'S PATENT CORRUGATED FLUES.
Telegrams "GAS LEEDS." London Office 69 Queen Victoria St E.C.

MANNESMANN

WELDLESS STEEL SPIGOT AND FAUCET PIPES

In Long Lengths up to 35 feet for
GAS & WATER MAINS.

A Perfect Substitute for Cast-Iron Mains.

— THE —
BRITISH MANNESMANN TUBE Co.
— LIMITED, —
110, CANNON STREET, LONDON, E.C.

R. & J. DEMPSTER, LTD.,

INCREASED CAPACITY
WITH
REDUCED PRESSURE.
LONGER CHARGES.
ORDINARY
GRIDS.

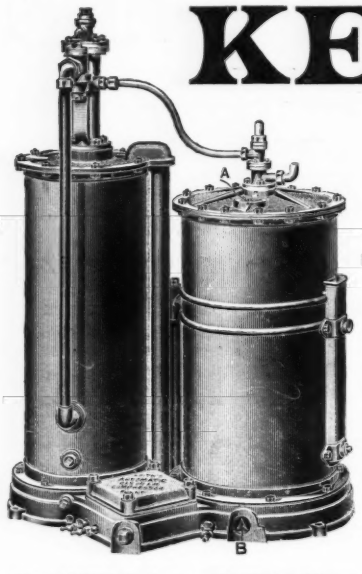
IMPROVEMENTS IN PURIFIERS.

WITH
or WITHOUT
WATER LUTES.
PATENT RUBBER
FASTENING.
SIMPLE VALVES and PIPES.

Write for Particulars.

MANCHESTER.

THE KEITH LIGHT



No. 3 Compressor, enclosed pattern. Water Driven.

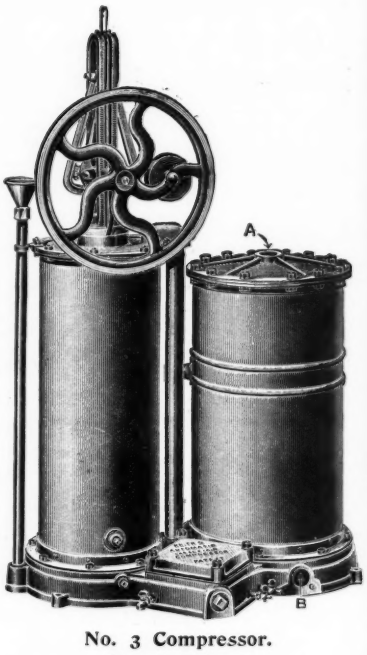
1600 Installations now in use.

Keith's Patent Gas Compressors are perfectly Automatic and require no attention.

Non-fluctuating.

Made in various sizes and arranged to give any constant pressure from 2-inch upwards.

DRIVEN BY ANY AVAILABLE POWER.



No. 3 Compressor. Power Driven.

Patentees and Manufacturers—

JAMES KEITH & BLACKMAN CO., LTD.,
27, FARRINGDON AVENUE,
LONDON, E.C.

CLAPHAM BROS., LTD., KEIGHLEY.

ESTABLISHED OVER 60 YEARS.

SOLE MAKERS OF

Laycock & Clapham's Patent **"ECLIPSE" WASHER-SCRUBBER**

Clapham's Patent **"ECLIPSE" WATER-TUBE CONDENSER**

Clapham's New Century Cover for Dry-Lute Purifiers with Patent

"ECLIPSE" JOINT AND RAPID AUTOMATIC FASTENERS.

MAKERS OF ALL IRONWORK—

for Carbonizing Plants, for Inclined or Horizontal System, Valves, Mains, Lamp-Columns, Tanks, &c.

London Representatives: Messrs. JONES & YOUNGER, Chesterfield House, 98, Gt. Tower Street, E.C.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and Published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 28, 1904.

UNIV. OF ... LIBRARY
14 ...

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

[REGISTERED AS A NEWSPAPER.

VOL. LXXXVI. No. 2146.] LONDON, JUNE 28, 1904. [56TH YEAR. PRICE 6d.

O'NEILL'S
OXIDE
GAS PURIFICATION
& CHEMICAL COMPANY, Ltd.
PALMERSTON HOUSE, LONDON, E.C.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 LONDON WALL.

TORBAY - - - - PAINT.
The TORBAY PAINT CO.,
26, 27, & 28, Billiter Street, London, E.C.
8, India Buildings, Fenwick St., Liverpool.
Also at Brixham & Dartmouth, Devon.

SULPHATE OF AMMONIA PLANT.
AIR & GAS COMPRESSORS.
IRON & BRASS FOUNDERS.
ACID PUMPING ENGINES.
FERRO-CYANIDE PLANT
DAVIS-NEILL PROCESS.
W. NEILL & SON
ST. HELENS JUNCTION.
Telegrams: 'NEILL, ST. HELENS.' Telephone No. 20.

TRADE MARK.
JOHN RUSSELL & CO., LTD.
Established at the Commencement of Gas Lighting.
MANUFACTURERS OF
TUBES & FITTINGS
For GAS, WATER, and STEAM,
STOCKS, TAPS, and DIES.
CHANDELIERS AND BRASS FITTINGS
Pendants and Brackets for Prepayment Meter Supplies.
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET, E.C.
WORKS:
WALSALL, WEDNESBURY, BIRMINGHAM.

PARKINSON AND W. & B. COWAN, LTD.,
Parkinson Branch: LONDON AND BIRMINGHAM.
See Advertisements on pp. 928 and 986.
Cowan Branch: LONDON, MANCHESTER EDINBURGH, & SYDNEY, N.S.W.
See Advertisement on Third Page of Wrapper.

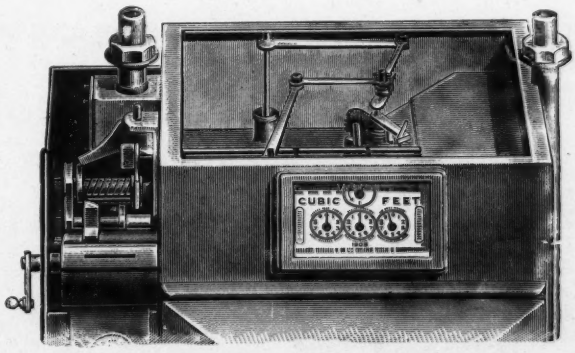
THOMAS PIGGOTT & CO., LTD.,
BIRMINGHAM.
MAKERS OF
GASHOLDERS
AND
GAS PLANT.
LONDON OFFICE: 63, QUEEN VICTORIA STREET, E.C.

CROSSLEY'S
"Otto" Gas-Engine
Crossley's Engines and Pumps
are used in all the most recent and important Towns' Water and Sewage Installations.
LATER PATENTS. MANY NEW IMPROVEMENTS.
CROSSLEY BROS., Ltd.,
OPENSHAW, MANCHESTER.

JAMES McKELVIE & CO.
CANNEL & GAS COAL EXPORTERS
HAYMARKET, EDINBURGH.
37 & 38, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
51 & 53, CASTLE STREET, LIVERPOOL.
PRICES AND ANALYSIS OF ALL THE PRINCIPAL
CANNEL and GAS COALS
forwarded on Application.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED.
41, OSWALD STREET, GLASGOW. NILE STREET, BIRMINGHAM. LONDON, LIVERPOOL, MANCHESTER CARDIFF, AND LEEDS.
TUBES & FITTINGS

GEORGE GLOVER & CO., LTD.,
SLOT METERS.
COMPACT.
DEFINITE.
DURABLE.



ORDERS
PROMPTLY
EXECUTED.

LONDON.
ROYAL AVENUE, CHELSEA.
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, London."

MANCHESTER.
138, PRINCESS STREET.
TELEPHONE: No. 09171.
WIRE: "Slot, Manchester."

LEEDS.
9, DEWSBURY ROAD.
TELEPHONE: No. 2390.
WIRE: "Meters, Leeds."

BELFAST.
TALBOT STREET.
WIRE: "Drymeters, Belfast."

R. & J. DEMPSTER, LTD. ON LAST PAGE BUT ONE.
ASHMORE, BENSON, PEASE, & CO., LTD. STOCKTON-ON-TEES.
Gasholders, Purifiers, Retorts, Scrubbers, Condensers, Washers, Exhausters, Boosters, Valves, Mains, Ammonia Recovery Plant, Steel Tanks, Structures, Ironwork,
GAS & WATER PIPES. JAMES & KUNALU RITCHIE, LTD. (Late James Ritchie), ACKLAM FOUNDRY MIDDLESBROUGH. TELEGRAMS "RITCHIE MIDDLESBROUGH."

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "*Braddock, Oldham.*" **OLDHAM,**

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "*Metrique, London.*" **LONDON, S.E.**

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS

OF ALL SIZES.

DRY GAS-METERS,

With Seamless Diaphragms.

IMPROVED WET GAS-METERS.

THORP'S PATENT WATER METERS.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

TILLEY BROTHERS' PATENT "SEAL" MAIN COCK.

NO NEED TO CAP SERVICES.

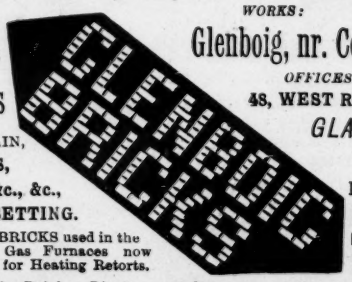
KEYS DO NOT FALL OFF & GET MISLAID.

FULL PARTICULARS—

53, KINGSLAND ROAD, LONDON, E.

THE GLENBOIG UNION FIRE-CLAY Co.

THE LARGEST MANUFACTURERS OF GAS-RETORTS IN GREAT BRITAIN, FIRE-BRICKS, BLOCKS, &c., &c., for RETORT-SETTING.



WORKS: Glenboig, nr. Coatbridge. Ltd.

OFFICES: 48, WEST REGENT ST., GLASGOW.

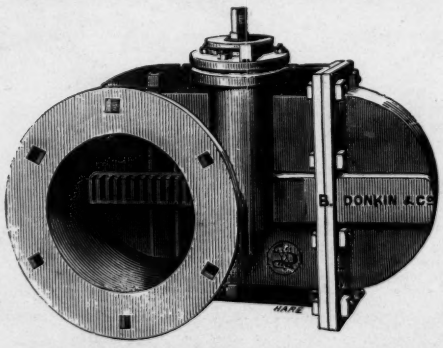
—43— Prize Medals & DIPLOMAS OF HONOUR. HIGHEST AWARD *wherever exhibited.*

The SPECIAL BRICKS used in the Construction of Gas Furnaces now being introduced for Heating Retorts.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

VALVES. VALVES. VALVES.

¾-in. up to 48-in. Diameter.



Original Makers of the **INTERNAL RACK AND PINION GAS VALVE** in 1847.

LARGE STOCKS KEPT. **PROMPT DELIVERIES.**

Considerably over **100,000** supplied.

MAKERS ALSO OF ALL OTHER TYPES OF VALVES FOR GAS, WATER, LIQUOR, CHEMICALS, & STEAM.

GAS EXHAUSTING PLANTS A SPECIALITY.

BRYAN DONKIN & CLENCH, Ld.,

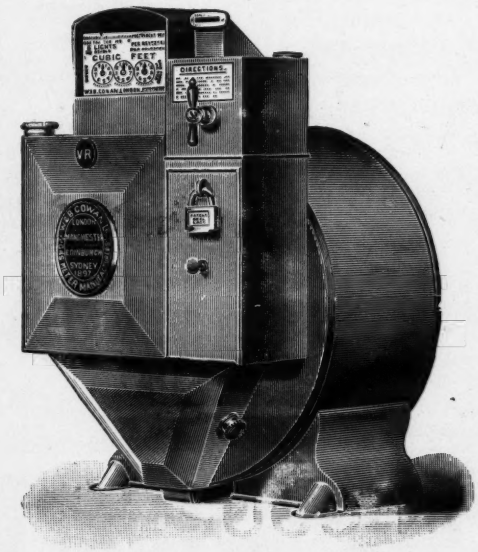
Lincoln Works, CHESTERFIELD.

Telephone: 84 CHESTERFIELD. Telegraphic Address: "DONKIN CLENCH CHESTERFIELD."

London Office: Parliament Mansions, Victoria St., Westminster, S.W. Manchester Office: 10, Mawson Chambers, Deansgate.

PREPAYMENT METERS.

Change Wheel System.



Prepayment Wet-Meter in Tin-Plate Case.

Prepayment Dry-Meter in Tin-Plate Case.

MADE TO TAKE PENNIES, SHILLINGS, OR ANY COIN.

GUARANTEED FOR FIVE YEARS.

PARKINSON AND W. & B. COWAN, LTD.

(COWAN BRANCH).

SMITH SQUARE WORKS, WESTMINSTER,	DALTON STREET WORKS, NEWTOWN,	BUCCLEUCH STREET WORKS,	COLONIAL METER WORKS, MACQUARIE PLACE,
LONDON, S.W.	**MANCHESTER.**	**EDINBURGH.**	**SYDNEY, N.S.W.**
Telephone No. 1643 Victoria.	Telephone No. 1545.	Telephone No. 753.	Telephone No. 2520.

THE GAS-METER COMPANY, LIMITED.

WORKS: LONDON, OLDHAM, DUBLIN.

MANUFACTURERS OF

EVERY DESCRIPTION OF

GAS-METERS.

STOPS AND SLOTS

Telegraphic Address: "METER LONDON." For Prices and Particulars, apply to F. W. CHURCH, Secretary, 238, KINGSLAND ROAD, LONDON, N.E. National Telephone: No. 142 DALSTON.

GAS RETORTS

HARRIS & PEARSON

STOURBRIDGE. ENGLAND.

GLAZED BRICKS, WHITE & IN COLOURS, PORCELAIN BATHS, FIRE-CLAY GOODS OF ALL KINDS, HARD BLUE PAVING BRICKS FOR RETORT HOUSES, BEST RETORT BOLTS, CAST-IRON RETORT MOUTHPIECES, FITTINGS, & LIDS, CAST-IRON GAS & WATER PIPES, & CONNECTIONS OF ALL SHAPES AND SIZES.

Manufacturers of

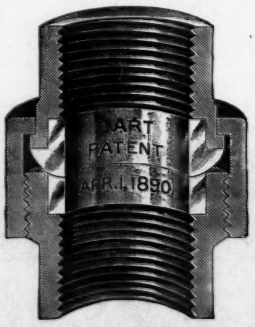
Fire Bricks, Lumps & Tiles

OF EVERY DESCRIPTION.

DART PATENT UNION COUPLINGS

These Couplings are made with Bronze Seat, and Ball and Socket Bearings, having joint ground perfectly true.

Their durability, their great convenience, and their extreme adaptability for various purposes, make the use of couplings of this construction very economical and advantageous.



They are used without any packing rings, and can be disconnected as often as desired, and again re-connected as easily as a common nut is tightened. The ball and socket joint secures absolutely tight connection, even when there are inaccuracies or variations in the alignment of the pipe. They are particularly adapted for use on locomotives, portable steam plants, or other machinery where convenience in disconnecting is an advantage.

Write for Catalogue No. 101.

THE FAIRBANKS CO., 78-80, CITY ROAD, LONDON, E.C. *Glasgow Office:* 9, HOWARD STREET.

STOURBRIDGE FIRE-BRICKS,

GAS-RETORTS, REGENERATIVE AND OTHER FURNACE BLOCKS, SILICA BRICKS FOR HIGH HEATS.

E. J. & J. PEARSON, LD., STOURBRIDGE.

ESTABLISHED 1860.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 28, 1904.